Bioscience Research Communications
Vol. 15, No. 1, February 28, 2003
Printed in Nigeria

0795-8072/2003 $12.00 + 0.00

BRC 2002029/15111

Growth of water leaf [*Talinum triangulare* (Jacq) Willd) from root cuttings and stem cuttings in the Semi-arid zone of Nigeria

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(Received April 30, 2002)

ABSTRACT: Studies on growth of *Talinum triangulare* (Jacq) Willd was investigated using 5cm cutting from root as well as apical and basal cuttings of stem. Cuttings were planted in loamy soil and watered once daily for 50 days in November/December 2000. Growth parameters such as height, number of leaves, fresh and dry biomass of leaves were recorded at 10 days interval up to 50 days after planting (DAP). The result showed that it is possible to propagate water leaf from root cuttings. Further, the root cuttings produced significantly ($P<0.05$) taller plants and high leaf number with corresponding increase in dry biomass of leaf than the apical and basal cuttings of stem, except for the fresh weight. The experiment has shown that it is ideal to grow this vegetable from root cuttings, since the roots are capable of resprouting so as to obtain higher growth over the stem cuttings that it allows the maximization of the vegetative part since the root is not consumed.

Key Words:

Introduction

Water leaf, *Talinum triangulare* (Jacq) Willd belongs to the family Portulacaceae. It is a very important and popular vegetable in West Africa especially in Nigeria. It is perennial herb that grows up to 20 – 30cm tall. Outside of its natural habitat in the high rainfall area, water leaf is cultivated but often its cultivation is limited to small scale operations either on a domestic level, kitchen or home gardens or as minor crops in indigenous mixed-cropping farming systems.

Wherever water leaf is cultivated, it is propagated either by seeds or by cuttings. When propagated by seeds, the seeds are normally sown on seed or containers and then transplanted when it is about 5 – 8cm tall but because the shoot is consumed, propagation by seed is not usually practiced. Therefore, propagation by cutting is more commonly practiced since it grows faster (1).

Root cuttings are used only occasionally in root stock propagation on account of the high labour demands of the technique and the relative establishment failure. The mazzard cherry root stock was propagated by one specialist in Australia using this technique. In trials conducted by Samus and Sukhotskil (2) and Osborne (3) working with soft wood cuttings of the apple root stock, the plant was found to root successfully using material root pieces of adult fruiting plants. Florov (14) working with *Budagovskii*

paradise reported that root cuttings were used to successfully propagate the plant. Irvine (5) had also reported that bread fruit and neem trees can be propagated using their roots. Similarly, Stoutemeyer (6) had earlier reported that juvenile forms of apple can be obtained from mature trees by causing adventeous shoots to develop from root pieces.

Wells (17) had shown that buds can arise from root pieces of oriental poppy (*papaver orientale*), horse radish (*Armoracoia rusticana)* and apple (*Malus sulverstris*). Hartman and Kester (8) also found that *Rosa blanca* (Rose), Syriga vulgaris (Lilac), *Albizia julibrissan* (Silk tree), *Ailanthus altissima* (tree of heaven), Plumbago sp. (leadwort), *Populus alba* (white poplar), Pyrus calleryama (oriental pear) can be propagated using their root pieces.

The part of the stem varies from species to species. Working with *Ilex creanata* (Japanese Holly), Wells (7) found that stout stem rooted better than light thin cuttings from the apex. Similar results have been obtained with cuttings of *Juniperus pfitzeriana* which had a small piece of more mature wood at the base that roots and grows faster than apparently exactly similar cuttings without a piece of mature wood from the apex. Similarly, Grace (9) working on trees such as oak, pruce and beach recommended that cuttings be taken from the basal parts. Little or no literature is available on *Talinum triangulare* with respect to effect of position of cuttings from stem as well as root cuttings on the growth. The aim of this report is therefore to provide information on the potential of root cuttings to grow and produce vegetative part.

Materials and Methods

Sandy loamy soil was collected in the premises of the department of Biological Sciences, University of Maiduguri on the 16th October 2000 for the experiment. The soil was sterilized in a mini-sterilizer of ½ cubic capacity for 30 minutes at 82°C (Mathew and Karikari, (10). The soil was used to fill wooden boxes of 1m x 1m dimensions with ten compartments.

Mature water leaf plants were collected from the Maiduguri market on the 19th October, 2000, washed and surface sterilized with 0.5% hypochloride solution.

Root cuttings (5cm long) were cut in slanting position using sterile blade. The cuttings were prepared in such a way that they were squared at the top and slanted at the bottom thus the top and bottom of the cuttings were differentiated. They were then inserted into the soil medium in an upright vertical position. The top was not allowed to stick out above the soil but was covered slightly with sand to produce better growth (10, 7).

Surface sterilized stems were cut into 5cm cuttings from the basal and apical portion respectively. Fifty pieces of each stem position were randomly divided into five lot of ten pieces. Each lot was then planted in a compartment giving five replicates per each stem cutting position and root cuttings respectively. Cuttings were inserted into the soil with only one node below the soil (in case of stem cuttings) and watered once daily. Each of the cuttings was numbered for identification.

Record of height of plants and leaf number were taken at 10 days interval up to 50 days after planting (DAP). At each sampling period, a table of random numbers were generated and were used to obtain 5 plants for destructive harvesting for fresh leaf biomass as well as leaf dry weight. The dry weight determination involved the harvested plant material at 70°C to constant weight. Means obtained from the results were analysed using Minitab Statistical Package. Means were judged to be significant at $P<0.05$. Means were separated using Duncans Multiple Range test.

Result

Leaf numbers

The effect of root and stem cuttings on leaf numbers is shown in Table1. The results showed that at all sampling times, the root cuttings produced significantly higher leaf numbers than the other treatments.

Table 1: leaf number of water leaf from root and stem cuttings at different sampling times.

Type of length cutting (cm)		Leaf numbers of plants at different sampling times (days after planting) [DAP]				
		10	**20**	**30**	**40**	**50**
Root	5	29.20a	45.20a	55.08a	60.20a	75.02a
Apical	5	3.50b	4.83b	11.53b	14.13b	20.83b
Basal	5	8.93c	16.70c	30.13c	30.47c	41.93c

Values within a column followed by the same letter do not differ significantly at P<0.05.

Plant height (cm)

Table 2 shows the effect of root cuttings from apical and basal portions of stem on height of water leaf. At 10 DAP, there was no significant)P<0.05) difference between the height attained by the treatments. At 20 and 30 DAP, the root cuttings produced significantly higher plants, however the basal stem cuttings had significantly higher plants than the apical cuttings. At 40 and 50 DAP, the root cuttings though significantly higher than the apical were not significantly different from the basal, but the basal remained significantly higher than the apical.

Table 2: Effect of root and stem cuttings on height (cm) of water leaf at different sampling times.

Type of length cuttings (cm)		Height of plants (cm) at different sampling times (days after planting) [DAP]				
		10	**20**	**30**	**40**	**50**
Root	5	5.54a	16.20a	26.60a	33.32b	42.02b
Apical	5	6.30a	10.47b	16.82b	23.95a	32.51a
Basal	5	7.91a	14.58c	21.00c	31.95b	40.30b

Values within a column followed by the same letter do not differ significantly at P<0.05.

Fresh leaf weight accumulation

The fresh leaf weight of plants produced from root cuttings and stem cuttings are presented in Table 3. The results show that at 10 DAP, significant higher fresh leaf biomass accumulated from root cuttings than the stem cuttings. At 20., 30, 40 and 50 DAP, there was no significant difference in leaf fresh weight despite the numerically high value of the fresh leaf weight of the root cuttings.

Table 3: Effect of root and stem cuttings on the fresh leaf weight (g) of plants at different sampling times.

Type of length cuttings (cm)		Fresh leaf weight (g) of plants at different sampling times (days after planting) [DAP]				
		10	20	30	40	50
Root	5	0.20a	0.96a	1.50a	1.65a	2.18a
Apical	5	0.07b	0.96a	1.50a	1.65a	1.31a
Basal	5	0.12b	1.07a	1.93a	1.79a	1.75a

Values within a column followed by the same letter do not differ significantly at P<0.05.

Table 4 gives the results of the effect of root cuttings and stem cuttings on the dry leaf weight accumulated by the plants at the different sampling periods. The results show that at 10 DAP, the basal cuttings and root cuttings had significantly (P<0.05) higher dry leaf weight accumulation than the apical cuttings. At 20 and 30 DAP, the root cuttings, had significantly higher dry leaf weight than the other treatments. At 40 basal and stem cuttings and roots cuttings had significantly (P<0.05) higher dry leaf weight accumulation than the apical. While at 50 DAP, there was no significant difference between the treatments.

Table 4: Effect of root cuttings and stem cuttings on the dry leaf weight of plants at different sampling times.

Type of length cuttings (cm)		Dry leaf weight of plants at different cuttings sampling times (days after planting) [DAP]				
		10	20	30	40	50
Root	5	0.021b	0.084b	0.112b	0.123b	0.128a
Apical	5	0.012a	0.052a	0.074a	0.095a	0.115a
Basal	5	0.022b	0.059a	0.125b	0.129b	0.133a

Values within a column followed by the same letter do not differ significantly at P<0.05.

Discussion

Although most species cannot be propagated using root cuttings, in this report, propagation of *T. triangulare* waS found to be possible using root cuttings. Comparison between root cuttings and shoot cuttings generally showed that growth was faster with the latter than the former, this result is interesting because few species of plants have been found to root by root cuttings and to grow better than stem. The result agrees with that of Samus and Sukhotskii (2) using the Mazzard Cherry root stock in Russia that the plant can be propagated by root cuttings. Osborne (3) in Ottawa also found this to be the case while working with apple. Florov (4) reported similar result for Budagovskii paradise while using root cuttings. Irvine (5), (Matthew and Karikari, (10) and Stoutmyer (6) showed that juvenile forms of apple and other species could be obtained from mature tree root pieces. As reported by Wells (7) and Harman and Kester

(8), growth from root cuttings as with *Talinum triangulare* is species specific. In such species, initial amount of food reserve in root cuttings allows for rapid production of leaves and more opportunity for light capture and photosynthesis leading to tall plants with corresponding increase in biomass.

With plants like water leaf, ability to propagate using their root pieces has a great advantage since most of the time the whole shoot is consumed leaving only the roots. Thus, these roots which are not consumed can easily be used to maximise the utilisation of plant since the root cuttings will root once conditions are favourable. Propagation with roots however has got some disadvantages. These include the difficulty of the techniques involved, and the fact that root cuttings should be taken when the plant is not in active growth, this is because the plant uses up its food reserve during the time new flushes are produced and therefore, the best time to take root cuttings would be just before the new growth starts. nevertheless, since the roots are normally discarded in water leaf and since growth is better than stem cuttings, it is ideal to grow the roots so as to maximise the vegetative part of this important vegetable.

References

1. Van Epenhuisen, C.W. (1974). Growing Native Vegetables in Nigeria. FAO, Rome, Italy.
2. Samus, V.A. and Sukhotskii, M.I. (1986). Propagation of clonal apple root stocks by root cuttings. Sadovodstro, No. 2, 13 – 15.
3. Osborne, R.H. (1983). Propagation of soft wood cuttings from root pieces to reintroduce juvenility in a new dwarf root stock. Combined Proceedings of International Propagators Society, 33: 361 – 366.
4. Florov, B.P. (1981). Propagation of clonal root stocks by root cuttings. Sbornik Nauchnykh Trudov, Vsesoyuznyi Nauchno Issledovatel' Skii Institute, Sadovodstva Imeni, I.V., Michurnia, 34: 92 – 96.
5. Irvine, F.R. (1959). West African Crops. Oxford University Press, London, pp. 223 – 224.
6. Stoutemyer, V.T. (1937). Regeneration in various types of apple wood. Iowa Agricultural Experimental Station research Bulletin, 220: 309 – 352.
7. Wells, J.S. (1979). Plant Propagation Practices. Macmillan, New York.
8. Hartmann, H.T. and Kester, D.E. (1975). Plant Propagation: Principles and Practices. Prentice Hall Inc., Eaglewood Cliffs, New Jersey.
9. Grace, N.H. (1939). Rooting of cuttings taken from the upper and lower regions of a Norway spruce tree. Can. Journ. Res. 17 ©: 172 – 180.
10. Mathew, I.P. and karikari, S.K. (1990). Horticultural Principles and Practices. Macmillan Education Ltd., London.