Response of Vine Cuttings to Rooting in Different Months in Three *Dioscorea* species

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Abstract: Availability period of vine cuttings of different Dioscoreas in the field reveals that *Dioscorea alata* L. can be maintained throughout the year for collection of vine cuttings. On the other hand vine cuttings of *D. oppositifolia* L., can be collected from June to December and *D. hispida* Dennst., can provide cuttings from June to October. Earlier or latter to this no cuttings will be available. Each vine cutting should have one or two nodes. One of the nodes should be in soil. One leaf must be there in each cutting. Since the leaf is responsible for photosynthesis and transpiration the area of the leaf may be kept in a comfortable size by trimming to maintain a balance between transpiration, photosynthesis and respiration. [Nature and Science 2009; 7(12):48-51]. (ISSN: 1545-0740).

Key words: Dioscorea, Vine cuttings, Rooting response

1. Introduction

Yams (*Dioscorea* spp.) constitute a staple food crop for over 100 million people in the humid and sub humid tropics. These are climbing plants with glaborous leaves and twining stems, which coil readily around a stake. They are perennial through root system but are grown as annual crops. The major yam growing region of the world are Asia, South America and West Africa (**Coursey,1967**; **Ayensu and Coursey,1972**).The tubers of *Dioscorea* have a dual agricultural function: first, as source of food for millions of people and secondly, as planting material (**Hahn, 1995**; **Craufurd *et al*, 2006**). The cultivated forms of this vegetative propagated crop have a large genetic diversity. Commercial scale of yam production meant for marketing or in domestic purpose, most farmers depend on different sources of seed tubers as planting material. Among these vine cuttings, mini setts and microtubers are preferred as seed tuber for yam planting (Abraham *et al*., 1986). In traditional practices the rural farmers generally use 100 to 600 gm or more tuber pieces as seed tuber which was 10 to 30% of the total yam yield. So the conventional farming by taking seed tuber is more costly than the vine cuttings and mini sett method and microtuber for yam planting. In yams under ground tubers are seriously affected by pathogen accumulation (**Malauri *et al*, 1995**) which reduces the quality of planting material. Transportation of high volumes of planting material for field planting is difficult. About 2,500 to 3,000 kg of planting material is required to plant 1 ha. Thus the cost of planting material increases the cost of production (**Onwueme, 1978**). The aim of this study is thus to standardize the response of vine cutting to rooting in different month of three Dioscorea species viz. *D. alata, D. hispida* and *D. oppositifolia* as chief method for production of disease free quality planting material for large scale propagation particularly in yam cultivation.

2. Materials and Methods

The experiment was conducted at the Botanical garden, Post Graduate Botany Department, Utkal University, Vanivihar, Bhubaneswar. Vine cuttings were collected in different months from field grown plants of *D. alata, D. hispida and D. oppositifolia* with one node and leaf was trimmed to half or remained as such with equal area. Immediately after collection the cuttings were dipped in water. The lowest node was treated with root promoting hormonal powder (ROOTEX-P, Bass Laboratories Ptv. Ltd.). Before starting of the experiment the nursery bed was prepared (90 cm X 90 cm) by mixing with sun dried sand and cow dung and was sterilized with Tricoderma viridae followed by Steptocycline at 0.015%. The nursery bed was wetted and the vine cuttings were planted, one by one in the nursery bed at close spacing by dipping with 0.02% bavistin to prevent further fungal incidence. Beds were watered twice daily using a rose can by considering the rainfall and status of the environmental condition of the days. Further in each month well rooted cuttings with leaf were planted in the field with standard agronomic practices. Various parameter viz. days taken for rooting, length of root (cm), No. of primary roots / cutting, No. of lateral roots /cutting, survival (%) in nursery bed and field, days taken for axillary bud development were recorded.

3. Results and Discussion

Vine cuttings can be established very quickly and an effective means of producing disease and nematode free planting material. Propagation of yam by vine cutting is not yet practiced in commercial plantings

because of intensive care required for rooting and low tuber yield from rooted cuttings, but it has a future. Standardizations of propagation of yam by vine cuttings will reduce the cost of cultivation and incidence of pest and diseases. In this trial, several aspects were investigated to standardize the methods of in vivo propagule production for sustainable means of yam cultivation in three *Dioscorea* species viz. *D. alata, D. hispida* and *D. oppositifolia*. The major problem militating against yam production in various tropical and subtropical regions is shortage of planting material which constituted about 33% of total cost outlay(**Orkwor and Asadu, 1997; Marfo *et al*, 1998**).The Yam nodal vine cuttings have offered valuable hope to break through in solving the problem of inadequate planting material. The study there fore was aimed at identifying the most effective, cheap, easy and readily available method for yam planting.

The rooting response of vine cuttings of all the three *Dioscorea* (*D. alata, D. hispida* and *D. oppositifolia*) species were observed month wise for development of propagules by planting in the nursery bed. Vine cuttings of *D. alata* rooted quickly i.e. in 7.87 days during August but longest time was taken during May (27.16days).Vine cuttings rooted quickly between July to October i.e. within a period of 7.87 to 11.05 days due to high humidity. During April-May (summer) and November, December and January (winter months) rooting was delayed due to temperature variations. Survival percentage was highest during rainy months of July to October (82.47%, 85.44%, 88.81%, 85. 12 %). The number of primary roots was highest during October (4.37) and lateral roots was highest during August (47.15) with maximum root length (21.26 cm) but reduced to a minimum of 5.56 cm in May. After transferring the material from nursery bed to the field survival percentage was highest in rainy season i.e. in the month of August (86.94 %). After the rainy seasons the axillary bud development was maximum (30.31) in the month of October. During summer and winter months, use of agro shed nets reduced the adverse effect of high temperature and low temperature (Table.1).

Similarly the vine cuttings of *D. hispida* were also capable to produce roots during June to October. The vines wither after October and completely dry by the end of December. D. hispida plants sprout quickly but leaf, development takes more time. Vine cuttings root quickly during September (15.49 days) with highest percentage of survival (82.91) in the nursery bed. Number of primary (4.20) and lateral (20.11) roots with maximum root length (3.50 cm) was found in the rainy season in the month of September. Survival % in field (46.69%) and time taken for axillary bud development (23.21 days) was quicker after rainy season i.e., in the month of October (Table 2). The vines of *D. oppositifolia* produced plenty of leaves from June onwards up to December. August and September is ideal for rooting of vine cuttings. During these months the number of primary roots (4.42), lateral root (20.98), and length of root (6.22cm), survival percentage in the field (63.90%) was highest in comparison from October to December. But minimum days (20.38 days) were taken for bud development in rainy season i.e. in the month of July. However, August to October was better as compared to other months. Rooted cuttings survived better (91.91%) during this period in the month of September in nursery bed. The growth and development of *D. oppositifolia* is quite different than *D. alata*. The vine cuttings withered during December with the production of microtuber (Table 3).

Amin *et al*. (1997) reported that in Shorea leprosula plantlet production through cutting in which rooting decreases when the leaf area increases. Hanses (1986) reported that cutting position and stem length also influence the rooting ability in leaf bud cuttings of *Schefflera arboricola*. Wang and Bogher (1988) reported that in Golden pothos nodal position and length of cuttings also determine the root retention for in vivo establishment. Vander and Escobar (1990) reported that expanded potato production in developing countries using cuttings as a source of good quality planting material is the simple low cost methods for root induction and establishment of the in vivo propagules for potato cultivation in warm tropical sites of Philippines. He also reported that there were no major differences in root and shoot development from cuttings differing in size and age. **Balogun *et al.* (2004)** reported that single node cuttings of two genotypes each of Dioscorea alata and *D. rotundata* from both plants grown in screen houses and in vitro plantlets were cultured in a tuberization medium. The screen house explants had significantly higher plantlet tuberization and primary nodal complex formation, and more tubers and primary nodal complexes per plantlet than in vitro explants, whereas in vitro explants performed better only in nodes per plantlet. It appears that in vitro tuberization is explant-, species- and genotype-dependent, the greatest variation being due to explant source. This is a first report of microtuber production from nodal explants of *D. rotundata* produced in a screen house. Production of microtubers from the vine cuttings of three Dioscorea species (*D.alata, D. hispida* and *D. oppositifolia*) revealed that the life span of the vine was highest in *D. alata* (63.81days) and least in D. oppositifolia (55.28 days). During this period, tuberisation was completed and the leafy cuttings withered.

Table 1. Rooting of vine cuttings of *D. alata* in different months

Sl. No.	Months	Days taken for rooting	Survival of cutting (%)	No. of primary roots / cutting	No. of lateral roots /cutting	Length of root (cm)	Survival (%) in (field)	Days taken for axillary bud development
1	January	19.60	41.96	2.94	20.64	12.73	13.20	24.20
2	February	16.60	46.26	2.72	23.30	13.79	18.07	21.28
3	March	14.57	61.93	3.09	28.06	13.15	33.59	26.07
4	April	23.83	73.65	1.73	18.38	11.48	37.04	26.23
5	May	27.16	64.25	1.90	13.81	5.56	43.05	25.86
6	June	17.42	75.66	2.04	18.30	11.20	74.20	21.07
7	July	10.85	82.47	3.70	40.92	17.23	85.23	18.28
8	August	7.87	85.44	2.87	47.15	21.26	86.94	19.27
9	September	9.45	88.81	3.11	40.73	17.40	78.93	28.40
10	October	11.05	85.12	4.37	35.57	15.74	64.89	30.31
11	November	20.74	66.25	3.88	28.24	11.60	38.24	18.48
12	December	24.94	51.92	2.84	20.73	11.29	36.39	27.42
S.E.M. ±		0.91	0.53	0.35	1.55	0.78	1.45	1.44
C.D. (0.05)		2.66	1.55	1.04	4.54	2.31	4.25	4.22

Table 2. Rooting in vine cuttings of *D. hispida* in different months

Sl. No.	Months	Days taken for rooting	Survival of cutting (%)	No. of primary roots / cutting	No. of lateral roots /cutting	Length of root (cm)	Survival (%) in (field)	Days taken for axillary bud development
1	June	25.13	56.09	1.25	7.30	1.09	21.97	24.24
2	July	21.25	66.32	2.28	12.63	1.22	43.93	24.84
3	August	17.31	77.93	3.28	20.13	2.80	46.69	25.91
4	September	15.49	82.91	4.20	20.11	3.50	45.90	23.53
5	October	25.76	57.59	1.89	8.02	2.78	22.32	23.21
S.E.M. ±		0.84	1.81	0.19	0.88	0.04	1.03	1.06
C.D. (0.05)		2.73	5.92	0.63	2.87	0.13	3.37	3.46

Table 3. Rooting in vine cuttings of *D. oppositifolia* in different months

Sl. No.	Months	Days taken for rooting	Survival of cutting (%)	No. of primary roots / cutting	No. of lateral roots /cutting	Length of root (cm)	Survival (%) in (field)	Days taken for axillary bud development
1	June	28.67	75.40	1.37	8.20	2.50	38.32	21.24
2	July	22.20	84.79	1.62	7.15	2.71	40.66	20.38
3	August	17.67	91.30	4.42	20.98	4.76	60.23	22.51
4	September	15.68	91.91	3.80	20.04	6.22	62.90	24.77
5	October	15.44	72.94	4.12	17.84	4.38	63.90	24.71
6	November	19.58	67.47	2.62	12.10	3.64	29.03	24.78
7	December	23.13	56.93	2.43	10.77	4.54	21.66	25.28
S.E.M. ±		0.62	1.09	0.09	0.58	0.43	0.77	0.64
C.D. (0.05)		1.92	3.36	0.28	1.80	1.35	2.37	1.97

4. Conclusion

Propagation of yams by vine cuttings is very useful for rapid multiplication of elite clones and as an alternative method of yam planting material production in commercial scale of yam cultivation. Though vine cutting is not yet practiced in commercial plantings but it has future. Vine cuttings of all the three Dioscorea responded well to rooting. D. alata can be propagated through out the year whereas *D. hispida* from June to October and *D.oppositifolia* from June to December.

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