

STUDIES TO INCREASE THE SPROUTING OF *DIOSCOREA DELTOIDEA*
RHIZOMES AT PESHAWAR AND DUNGAGALI

by

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Summary. Experiments were conducted at Peshawar (Sub-tropical, 320 m elevation, 407 mm annual rain fall, canal irrigated) and Dungagali (moist temperate, 2500 m elevation, 1650 mm annual rain fall) to develop methods for growing *Dioscorea deltoidea*,

Rhizomes were collected in November from Murree and stored for one and two months at Peshawar in 1:1 soil and sand mixture at one metre depth and planted after the storage period. Two months storage period gave significantly high (at 5% level) sprouting as compared to one month storage.

Planting of full size rhizomes were tested against rhizome pieces (5, 7.5 and 10 cm). Though full rhizomes gave significantly higher sprouts, planting 5 cm pieces with one or two buds each would give a higher total number of plants.

At Dungagali July planting gave significantly higher sprouts on 25th August, 1977 as compared to November planting.

Indole acetic acid treatment did not significantly increase sprouting.

Introduction. Genus *Dioscorea* (yams) belongs to the family Dioscoreaceae. It comprises of about 600 species which are mainly distributed in the tropical zone.

Diosgenin extracted from the rhizome of sapogenin bearing *Dioscorea* species was found to be suitable starting material for the preparation of cortisone, used in rheumatoid arthritis. *Dioscorea deltoidea* locally known as "kanis", naturally occurs in the hilly areas of Pakistan. Preliminary experimental cultivation of the plant indicated that the rhizomes are very slow growing and take 5 to 6 years for maturity. It was further observed that the sprouting of rhizomes was very low. Studies were carried out to increase the sprouting of rhizome pieces with different treatments and the results achieved are reported below:

Review of literature. Anon (1) reported that crown portion of *Dioscorea floribunda* rhizome required 20 days of storage prior to planting as compared to median and tail portions which required two to three months of storage before planting to give eighty to hundred percent sprouting. Campbell *et al* (2) reported that the rate of rhizome development in *Dioscorea* species largely depends upon the breaking of dormancy of setts by storage for a particular period of time provided adequate moisture is available in the soil. Coursey (3) documented different techniques used in the propagation of *Dioscorea* species

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which are being commonly practised in the tropical countries. Martin (4) reported that dipping of rhizome pieces of some species in 8% solution of ethylene chlorohydrin and 2% solution of ethophon for five minutes reduced sprouting time by one to two weeks and increased sprouting capacity of the rhizomes. Miede (5) studied the effect of planting different portions of rhizome on the sprouting of *Dioscorea cayenensis* and concluded that crown portion sprouted earlier as compared to other portions and gave 10 to 15% higher yield. Onwuerne (6) studied the sprouting process in different *Dioscorea* species and stated that large rhizome pieces sprouted more rapidly and gave rise to more shoots than smaller pieces when planted at the normal time of sprouting.

Material, Method and Results. Various experiments were conducted at Peshawar and Dungagali to increase the sprouting of kanis rhizomes:

To study the effect of storage and planting different rhizome portions on sprouting, kanis rhizomes collected from Murree area on 8th November, 1976 were stored in a mixture of moist soil and fine sand (1:1) at a depth of one metre for one and two months (9th November to 11th January, 1977) at Peshawar Farm under field conditions. The rhizomes of the first lot were dug up on 10th December, 1976, cut into three portions (crown, median and tail) and planted the same day on raised beds. The rhizomes of the second lot were dug up on 12th January, 1977 and treated as those of the first lot and planted on the same day on raised beds. Data on the sprouting of rhizomes were recorded upto 31st May, 1977 and results are given as under:

TABLE 1

Effect of storage on the sprouting of Dioscorea deltoidea rhizome portions (out of 264 planted) at Peshawar Farm

Storage period prior to planting						
Replica- tions	One month			Two months		
	Number of sprouts			Number of sprouts		
	Crown	median	tail	Crown	median	tail
1.	123	88	98	158	148	162
2.	119	103	108	100	93	90
3.	115	137	105	168	140	153
4.	142	118	107	156	139	157
5.	107	84	102	165	134	153
6.	154	113	126	173	166	158
Storage mean	114			145		
Storage duration				S		
Rhizome portions				N.S.		
Rhizome portions × storage duration				N.S.		

Table 1 indicates that significantly higher number of sprouts was obtained by storing the rhizomes in a mixture of silt and soil for a period of two months prior to planting at Peshawar. Different rhizome portions did not have any significant difference in their sprouting of rhizomes as long as one or two buds are present on any portion.

To determine the optimum length of rhizome to plant, rhizomes were collected from Sharan area on 5th October, 1976. The material was brought in moist gunny bags to Peshawar. Rhizomes were divided into 5, 7.5 and 10 cm pieces, each having an average number of one to two buds. The different sized pieces and full rhizomes measuring (15-20 cm) were planted on ridges in a randomised complete block design replicated four times on 7th October, 1976 at Peshawar Farm. 72 rhizome pieces and full rhizomes were planted in each plot. Final observations on the sprouting of rhizome pieces and full rhizome were recorded on 5th May, 1977, as under:

TABLE 2

Sprouting of different sized pieces (72) of Dioscorea deltoidea rhizomes planted at Peshawar

Replications	Size of rhizome pieces			Full rhizome
	5 cm	7.5 cm	10 cm	(15-20 cm)
1.	36	39	42	52
2.	41	42	48	58
3.	41	39	42	56
4.	36	41	38	43
Mean	39	40	43	55

Though full sized rhizomes gave significantly higher sprouting % at 5% level as compared to rhizome pieces, cutting the rhizomes in 5 cm pieces and planting them would give larger number of plants as compared to planting the full rhizomes.

Another experiment was laid out to test the best season of planting (July vs November), optimum number of years for which the plant should be grown before harvest, and the effect of fertilizers on the yield of *Dioscorea deltoidea* rhizomes. 30,600 rhizome pieces each 5 cm long, were planted at Dungagali Farm in July, 1976 and the same number in November, 1976. The rhizomes were cut into 5cm pieces and planted without any storage. The planting area was cleared of shrubs and other ground vegetations and dug up manually

to a depth of 30 cm. Rhizome pieces were planted in rows spaced 60 cm at 8 cm depth. Observations on sprouting recorded on 25th August, 1977 are given below:

Replication	July Sprouts out of 6120 planted	November Sprouts out of 6120 planted
1.	2209	1595
2.	1983	1412
3.	1819	1548
4.	2030	1700
5.	2029	1992
Mean	2014	1649

"t" test revealed the superiority of July over November planting (5% level)

In an attempt to increase the sprouting % of rhizomes pieces, 32 pieces measuring 5 cm each having an average number of one to two buds per piece, were treated with 0.1% solution of Indole Acetic Acid, soaked in it for one hour, quick dipped, and their buds painted with I.A.A. solution. Similarly seven sets of 40 rhizome pieces each were treated with I.A.A. of different concentrations i.e., 0.5, 0.12, 0.06, 0.03, 0.015 and 0.007% for five minutes. An extra set of 40 rhizome pieces was kept as control. Treated rhizome pieces of each experiment were later on planted separately in earthen trays in randomised complete block design with four replications on 6th and 12th August, 1976 respectively at Peshawar Farm. Final observations on sprouting was recorded on 4th November, 1976. None of the treatments improved sprouting.

References

1. ANONYMOUS. 1976. Studies on the effect of storage of *Dioscorea floribunda* tubers on sprouting. Unpublished report of Indian Agriculture Research Council, New Delhi. pp. 37-59.
2. CAMPBELL, J.S. *et al.* 1952. Recent developments in the production of food crops in Trinidad. Trop. Agri., Trin. 39 (4) pp.261-270
3. COURSEY, D.G. 1962. Yams. Tropical agricultural series. Longmans, Green and Co., Ltd., London, pp. 1-230.
4. MARTIN, F.W. *et al.* 1977. Tropical yams and their potential, Part IV *Dioscorea rotundata* and *Dioscorea cayenensis*. U.S. Department of Agriculture in cooperation with Agency for International Development pp. 1-35.
5. MIEGE, J. 1957. Influence de quelques caracteres des tubercules semences sur la levee et le rendement des ignames cultivees, J. Agric. Trop. Bot. Appl., 4 (7-8) pp. 315-342.
6. ONWUEME, I.C. 1973. The sprouting process in yam (*Dioscorea* spp.) tuber pieces J. Agri. Sci. 88, pp. 375-379.