

STUDIES ON THE OPTIMUM PERIOD OF GROWTH, EFFECT OF SOIL WORKING AND FERTILIZER APPLICATION ON THE YIELD OF *DIOSCOREA DELTOIDEA* RHIZOMES AT SHARAN (KAGHAN VALLEY)

*Anwar Ahmad Khan, Shakeel Haider Zaidi and Zainul Arifeen

Abstract. Experiments were carried out to determine the optimum age to which the plant should be grown, economical method of cultivation and effect of different fertilizers on the yield of *Dioscorea deltoidea* rhizomes at Sharan in their natural habitat. Data collected revealed that there is significant increase in the weight of rhizomes with increase in the duration of time (number year). Soil working and application of N 90 kg and NP 135 kg per hectare gave higher yield as compared to control. Interim result based on the yield of three years, 1975, 1976 and 1977 are presented in this paper. The experiment would continue for a further period of two years.

Introduction. Diosgenin, extracted from the rhizomes of sapogenin bearing species of *Dioscorea* (yams) is the precursor for the preparation of cortisone, a potent life saving drug. In addition it is also used as a base material for the preparation of progesterone and estrogen which are widely used for the manufacture of contraceptive pills throughout the world.

Dioscorea deltoidea occurs in the moist temperate mountains of Pakistan and contains 3 to 4% of diosgenin in the rhizomes on oven dry basis. Our surveys, indicate that 1,80,000 kg of dried rhizomes can be collected per annum from Hazara, Swat, Dir, Chitral and Murree forest areas for the manufacture of diosgenin in Pakistan. Recently a pilot project for the extraction of diosgenin from *Dioscorea deltoidea* rhizomes has been started by Kurram Chemical Company. About 36,000 kg of rhizomes are being collected this year for the extraction of diosgenin. Since the plant is uprooted in extraction, its large scale harvesting may result in its extermination, especially from the more accessible areas. It was therefore, decided to learn how to propagate the plant in the forest.

Material and method. Kanis rhizomes were collected from Sharan forest of Kaghan Forest Division on 18th and 19th August, 1974. The next day they were cut into 5 cm pieces, each with at least one eye, and planted under the designated method of planting in rows 60 cm apart, with plants in the row spaced at 30 cm, in a plot 30 m² in area.

Where soil working was indicated, the plots were dug to a depth of 30 cm before planting. Where no soil working was the treatment, the pieces were dibbled at the above mentioned spacing 10 cm below ground. Fertilizer nutrient N 90 kg, NP 135 kg and P 45 kg/ha was applied in soil working plots by uniform broad-casting and then thoroughly mixing up in the soil with the help of spades. In plots marked with N.S.W. the weeds were

* Medicinal Plant Botanist and Research Assistants respectively at the Pakistan Forest Institute, Peshawar.

removed upto ground level with the help of sickles and the fertilizer was broadcast in the plot. Plots relegated to soil working treatment were weeded and hoed three times a year—in July, August and September. At the same time weeds were cut with sickle at 1 cm height in plots with no soil working treatment. Rhizome were dug up from plots relegated to the relevant treatments in November after one, two and three years of growth for recording the yield of rhizomes.

Results and discussion. Comparative mean yield of rhizomes with different growth periods, various cultral and fertilizer treatments are presented below :

Mean yield of fresh rhizomes in kg per plot

Treatment	Weight of rhizomes planted per plot	P ₁ : yield after one year growth. 1974—75		P ₂ : yield after two year growth 1974—76		P ₃ : yield after three year growth 1974—77	
		SW	NSW	SW	NSW	SW	NSW
0	0.91	1.24	1.12	2.00	1.57	3.10	2.62
N 90 kg/ha	0.91	1.29	1.16	2.16	1.82	3.70	2.85
NP 135 kg/ha	0.91	1.18	1.16	2.90	1.90	3.80	2.67
P 45 kg/ha	0.91	1.24	1.13	2.52	1.51	3.35	2.70
Periods mean yield		1st year		2nd year		3rd year	
		1.19		2.11		3.10**	
		LSD at 1% 0.23					
Soil operations mean yield		SW				NSW	
		2.41**				1.85	
		LSD at 1% 0.02					
Fertilizers mean yield		N		NP		P	
		2.24**		2.27**		2.08	
						1.95	
		LSD at 5%		0.12			
		LSD at 1%		0.16			

SW = Soil working, NSW = No soil working, N = Nitrogen,
 NP = Nitrogen and Phosphorus, P = Phosphorus,
 ** = mean difference is significant at 1% probability level.

The yield of rhizomes significantly increased from year to year (1st year 0.28, 2nd year 1.19 and 3rd year 2.19 kg) as compared to the weight of planted rhizomes (0.91 kg) with increase in duration of time. Soil working gave highly significant yield (2.41 kg) of rhizomes as compared to no soil working plots (1.85 kg). Application of fertilizer NP and N gave significantly higher yield (2.27, 2.24 kg respectively) as compared to P fertilizer (2.07). N and NP fertilizers though increased the yield of rhizomes but their interaction was found to be non significant.

Conclusion. *Dioscorea deltoidea* rhizomes are very slow growing and the rhizomes take a longer period for maturity. This fact has been proved by the above experimental results. It may be safely concluded that on an input of 303 kg of rhizomes per hectare, the expected gross increase in the yield of rhizomes would be to the tune of 1,267 kg/hectare after a period of three years growth with soil working and application of NP nutrient at the rate of 135 kg/hectare.

Acknowledgement. The authors are grateful to Mr. Afzal Cheema, Assistant Biometrician, Mensuration Branch for help in statistical analysis, Mr. Azim Khan for assistance in data collection and to Mr. Mohammad Haroon for typing the script.