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Effect of Size of Planting Material on Growth, Yield and Economics of Taro (*Colocasia esculenta* L. Schott) in Subtropical Areas of Arunachal Pradesh

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ABSTRACT

Taro (Colocasia esculenta L. Schott) is one of the most important tuber crops extensively grown in North Eastern States. The corm and cormels are the major economic part however, the leaves, flowers and petioles are also used as food by the inhabitants of Arunachal Pradesh. Taro does have the potential to become a significant commercial tuber crops due to the wide range of food items can be prepared from it. In Taro cultivation planting material is a problem. Corms and cormels are used as planting materials and its size and weight plays a vital role on production of taro. To investigate the effect of size of corm on the growth and yield of the taro a field experiments were conducted during 2016 and 2017 at demonstration cum experimental farm of KVK Tirap, Arunachal Pradesh with 8 treatments and 3 replications under randomized block design by using 'Kani kachu' cultivar. Plant growth parameters and yields were found to be increased with increased in seed size. Seed cormels weighing 30g was found to be economic planting material of taro resulting in higher net return with highest benefit cost ratio of 2.12. Bigger size seed cormels weighing in 40g, 50g, 60g, 70g and 80g were not desirable owing to higher cost of seed cormel resulting uneconomical yield.

Key words: *Taro, Corms, Growth, Yield and Economics*

INTRODUCTION

Taro *(Colocasia esculenta* L. Schott*)* is a herbaceous, perennial root crop that belongs to *Araceae* family. It is one of the most important tuber crops extensively grown in North Eastern States which is very rich in vitamin and minerals. Being a native to India, it ranks fifth among the root and tuber crops, after potato, cassava, sweet potato and yams. The digestibility of taro starch has been estimated to be 98.8% and is used in baby foods, hypo-allergic foods and as a cereal substitute in diets victims of celiac disease[10]. The corm and cormels are the major economic part of the taro. Occasionally, the leaves, flowers and petioles are used for food depending up on the cultivars and the culture[2]. It is mainly cultivated for its edible corms and cormels besides its petioles and tender leaves are also consumed as cooked vegetables[1,11].

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Taro does have the potential to become a significant commercial tuber crops due to the wide range of food items that can be prepared from its tubers, stolons, shoots and leaves[4]. In Taro cultivation planting material is a problem. The edible corms and cormels are use as propagation material[8]. Tuber seed size and weight plays a vital role on yield, economics and yield contributing characters in taro cultivation[12]. The use of large size of corms and cormels as seed materials, increased the cost of cultivation as substantial amount of produced is required for seed material. At the same time, it was uneconomical as the cost of seed corm increased. However, information regarding economic seed corm size for higher yield and maximum economic return is lacking. Therefore, the objective of this study was initiated to investigate the effect of size of corm on the growth and yield of the taro and identify the optimum corm size that maximize the growth parameters, yield and economics of taro cultivation.

MATERIAL AND METHODS

A field experiment was conducted during 2016 and 2017 at demonstration cum experimental farm, Krishi Vigyan Kendra, Tirap, Deomali, Arunachal Pradesh (Latitude 27°11´28″N, Longitudes 95°27´50″ E and altitude 129 m above MSL). The soil of the experimental site was sandy loam, acidic in reaction pH 5.6, medium in organic carbon content (0.69%), low in nitrogen (240.56 kg/ha), medium in phosphorus (22.54 kg/ha) and low in potassium (98.73 kg/ha). The climate of the site is hot and humid. The average SW monsoon rainfall (June-Sept.) : 1589.6 mm with 83.11 rainy days, NE monsoon rainfall (Oct.- Dec.): 148.0 mm with 11.66 rainy days, winter rainfall (Jan-Feb) : 53.6 mm with 6.44 rainy days and summer rainfall (March-May) :728.8 mm with 38.33 rainy days, with a grand total annual rain fall of 2520.00 mm and 139.54 rainy days was recorded.

The experiment was laid out in Randomized Block Design with eight treatments and three replications with a popular taro cultivar ‘Koni kachu’. The treatments were comprised of eight seed cormel weights *viz.* 10g, 20g, 30g, 40g, 50, 60g, 70g and 80g. The planting was done in the first week of March in both the years at the spacing of 60cm x 45cm and the normal package of practices was followed uniformly for all the treatments.

Observations on plant height and number of leaves per plant were recorded on 5 plants from each plot at 125 days after planting. The crop was harvested at 170 days after planting. Data (mean of 5 plants) on number of corms/plant, number of cormels/plant, corm yield/plant and cormel yield/plant were recorded at harvest. The cost of cultivation, net return and benefit cost ratio were also worked out for economics of cultivation. The data on parameters were subjected to analysis of variance (ANOVA) using Genstate software. Comparison of treatment means for significance at 5% was done using the critical difference (CD) method.

RESULT AND DISCUSSION

The growth characters were significantly influenced by different size of seed cormels (Table 1). An increasing trend of all the characters was observed with increasing size of planting material. In general, the higher the weight of seed cormel used taller the plant with more number of leaves per plant. Similarly, bigger sized seed cormel produced significantly more number of corms and cormels per plant. The treatment with corm size of 80 g produced tallest plant height (52.7 cm and 52.2 cm), highest leaf numbers/plant (5.23 and 5.17), maximum numbers of corms/plant (2.0 and 2.2) and cormels/plant (26.87 and 27.0) respectively in both the year 2016 and 2017. These might be due to the presence of higher food materials and more number of auxiliary buds on large cormels. Sikder *et. al.*[12] also reported similar findings and recorded significant effect of weight of planting materials in taro. The superior result on numbers of corms and cormels per plant in

80 g size treatment was in agreement with the result of Gebre, *et. al.*[3].

Data on corm and cormel yield were also indicated significantly increasing trend with increasing seed size (Table 1). The corm yield per plant rose from 145.93 g in 10 g seed cormel to the highest of 193.60g in 80 g seed cormel in 2016. Similarly, corm yield per plant in 2017 was also rose from 148.43 g in 10 g seed to 197.06 g in 80 g seed cormel. In case of cormel yield per plant also 80 g seed cormel recorded significantly higher yield in both the years. Mohankumar and Sadanadan[7] and Misra *et al.*[6] also observed significantly higher tuber yield in plants developed from bigger size cormels. However, Prabhakar and Nair[9] observed that yield was found to be unaffected by the use of two different seed cormel sizes *viz.* 15-20 g and 30-35 g.

The yield per hectare was increased from 12.50 t/ha to 20.0 t/ha in 2016 and from 12.7 q/ha to 20.1 t/ha in 2017 at 10g and 80g seed cormel respectively (Table 2). Similar trend of results on yield of taro also reported by Singh *et. al.*[13]. The net return increased with increase in seed cormel weight upto 40 g and then decreased with increasing seed cormel weight. But the highest cost benefit ratio of 2.12 was recorded in 30 g seed cormel and the lowest cost benefit ratio of 1.50 was recorded in 80 g seed cormels, which might be due to higher cost of seed cormels. Seed cormels weighing 40 g and more, though recorded higher yields their benefit cost ratios were found to be low due to higher cost of planting materials. The 30 g size seed cormel was most economical and may be used as planting material for economic cultivation of taro. Mathur *et al.*[5] also reported that the highest yields were obtained when cormels of 56 g were used but cormel weight of 28 g was most economical.

SUMMARY

Field experiments were conducted during 2016 and 2017 to study the effect of size of planting material on growth, yield and economics of Taro cultivation at demonstration cum experimental farm of KVK Tirap, Arunachal Pradesh. Plant growth parameters and yields were found to be increased with increased in seed size. Seed cormels weighing 30g was found to be economic planting material of Taro resulting in higher net return with highest benefit cost ratio of 2.12. Bigger size seed cormels weighing in 40g, 50g, 60g, 70g and 80g were not desirable owing to higher cost of seed cormel resulting uneconomical yield.

Table 1. Effect of size of planting material on growth and yield of taro

Cormel size (g)	Plant height (cm)		No. of leaves/pt.		No. of corms/pt.		No. of cormels/pt.		Corm yield (g/pt.)		Cormel yield (g/pt.)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
10	43.60	43.50	4.67	4.26	1.30	1.20	17.60	17.70	145.93	148.43	168.23	172.20
20	43.70	43.70	4.61	4.30	1.53	1.36	21.37	21.40	173.96	175.07	237.70	242.10
30	45.70	45.20	4.37	4.47	1.52	1.40	26.07	26.00	180.50	179.07	285.70	291.40
40	45.80	45.20	4.64	4.70	1.74	1.47	26.10	26.20	183.76	184.07	303.30	297.60
50	46.40	46.30	4.72	4.80	1.68	1.62	25.36	25.30	185.06	184.56	314.10	307.90
60	47.80	47.70	4.95	4.82	1.80	1.83	26.30	26.40	186.63	186.70	312.20	302.80
70	49.40	49.20	5.08	5.06	1.91	1.87	26.40	26.60	189.52	190.24	319.30	315.43
80	52.70	52.20	5.23	5.17	2.00	2.20	26.87	27.00	193.60	197.06	324.60	322.30
CD (P=0.05)	2.50	2.41	0.58	0.49	0.33	0.24	1.63	1.72	3.77	3.90	6.85	5.94

Table 2. Effect of size of planting material on economics of taro cultivation

Seed cormel size (g)	Yield (t/ha)			Cost of cultivation (Rs./ha)	Net return (Rs./ha)	Benefit cost ratio
	2016	2017	Mean			
10	12.50	12.70	12.60	24,885.75	41,061.48	1.65
20	16.10	16.30	16.20	27,721.80	57,384.12	2.07
30	18.10	18.30	18.20	30,557.85	64,782.64	2.12
40	18.90	18.80	18.85	36,393.90	70,604.16	1.94
50	19.30	19.20	19.25	37,229.95	65,152.41	1.75
60	19.30	19.00	19.15	39,066.00	59,380.32	1.52
70	19.60	19.40	19.50	40,315.60	61,279.71	1.52
80	20.00	20.10	20.05	41,237.75	61,856.62	1.50
CD (p=0.05)	1.25	1.04	-	-	-	-

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