Effect of nursery techniques on early growth attributes of minisett-cultivated cassava (*Manihot esculenta* Crantz)

KT SRUTHY and G RAJASREE

Department of Agronomy, College of Agriculture (KAU)
Vellayani, Thiruvananthapuram 695522 Kerala, India
Email for correspondence: ktsruthy@gmail.com

 Received: 22.02.2020/Accepted: 04.03.2020

ABSTRACT

Investigations were done to find out the effect of nursery techniques on minisett-cultivated cassava at College of Agriculture, Vellayani, Thiruvanathapuram, Kerala during April to June 2017. The objective was to find out a viable nursery technique for cassava minisett cultivation. For this two types of minisett cuttings and three types of potting media were tried in the nursery. The three-node cuttings of cassava minisett resulted in significantly higher seedling sprouting, shoot length, shoot biomass, root length and root biomass. Among different potting media used in the experiment, coir pith compost and vermicompost in the ratio of 3:1 and normal top soil and coir pith compost in the ratio of 1:1 resulted in higher seedling sprouting compared to normal top soil as potting medium but former treatment performed better with respect to shoot length, shoot biomass, root length and root biomass of minisett seedlings. The interaction of three-node cuttings of cassava minisett and coir pith compost and vermicompost in the ratio of 3:1 gave better results than other combinations. The results of the study indicated that raising three-noded minisett cassava cuttings in potting medium containing coir pith compost and vermicompost in the ratio of 3:1 in the nursery performed better wrt shoot length, shoot biomass, root length and root biomass.

Keywords: Cassava; minisetts; potting media; nursery technique; cuttings

INTRODUCTION

Cassava is considered as the future food crop due to its biological efficiency coupled with ability to sustain under changing climate especially during drought and to grow well in marginal soils. With the development of high yielding short duration varieties year round planting of cassava is possible and the farmers prefer short duration varieties for high intensity cropping.

Among the short duration varieties of cassava, Vellayani Hraswa is a high yielding cassava variety released from Kerala Agricultural University. Minisett technique using short duration cassava variety is a good option for rapid multiplication of cassava planting materials for the production of rooted cuttings especially for the contingent planting in aberrant rainfall. With this background the present study was undertaken to evaluate the effect of nursery techniques on minisett-cultivated cassava.

MATERIAL and METHODS

The study consisted of nursery experiment which was conducted in the instructional farm of College of Agriculture, Vellayani, Thiruvanathapuram, Kerala. The treatments in the nursery comprised two types of minisett cuttings (m_1: two-node cuttings and m_2: three-node cuttings) and three types of potting media (p_1: normal top soil, p_2: normal top soil and coir pith compost in the ratio of 1:1 and p_3: coir pith compost and vermicompost in the ratio of 3:1). The experiment was laid out in completely randomised design with eight replications and normal sett planting in the main field as control. For the experiment, two-node and three-node minisett cuttings were taken from healthy stem of Vellayani Hraswa using circular wood saw attached to a power cutting machine. Immediately after cutting, minisetts were planted in fifty cavity protrays. Three different types of potting media viz normal top soil, top soil and coir pith in the ratio of 1:1, coir pith and vermicompost in the ratio of 3:1 were prepared and

Table 1. Chemical properties of the potting media used in the experiment

Parameter	Potting medium content		
	Normal top soil (p_1)	Top soil and coir pith compost in 1:1 proportion (p_2)	Coir pith compost and vermicompost in 3:1 proportion (p_3)
Soil reaction (pH)	5.12	6.56	6.23
Electrical conductivity (dS/m)	0.081	0.766	1.26
Organic carbon (%)	0.69	2.95	4.37

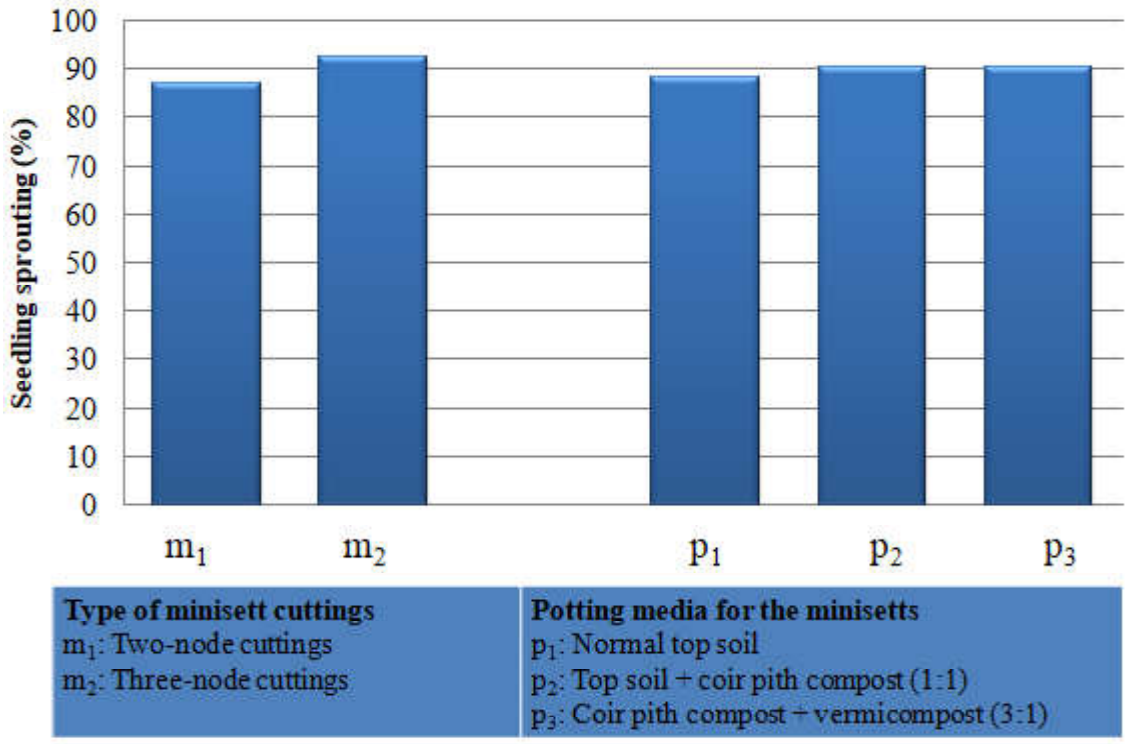

Fig 1. Seedling sprouting (%) under cassava minisett cuttings and potting media

filled uniformly in the protrays. Chemical properties of potting media were evaluated (Table 1). The protrays were kept in a secondary hardening unit which provided a rain-sheltered condition and partial shade for minisetts. Observations on shoot length, shoot biomass, root length and root biomass at three, four and five weeks after planting (WAP) were recorded.

RESULTS and DISCUSSION

The three-node cuttings of cassava minisett (m_2) resulted in significantly higher seedling sprouting (Fig 1), shoot length, shoot biomass, root length and root biomass at 3, 4 and 5 WAP. The main effects were found to be significantly influencing the seedling sprouting in nursery. The m_2 (three-node cutting) was found to have higher seedling sprouting (92.26%) than m_1 (two-node cutting) resulting in sprouting of 87.08 per cent. The m_2 (three-node cutting) resulted in significantly higher shoot length at 3 (7.26 cm), 4 (9.62 cm) and 5 (11.10 cm) WAP as compared to m_1 (two-node cutting) which produced a shoot length of 5.73, 8.91 and 9.57 cm at 3, 4 and 5 WAP respectively (Table 2). Shoot biomass/seedling significantly differed with type of cassava minisett cuttings. The m_2 was found to be producing the highest shoot biomass/seedling at 3, 4 and 5 WAP (4.08, 4.63 and 5.06 g/seedling respectively).

The three-node cuttings expressed a head on advantage over the two-node cuttings due to greater initial dry matter content or stored food materials as

pointed out by Bridgemohan and Bridgemohan (2014) which might have been reflected in the early growth attributes. An increase in size of minisetts enhancing the sprouting potential was also reported by Ayankanmi et al (2005) in yam. The three-node minisetts producing higher rooting percentage, number of roots and root length than the two node minisetts was reported previously by Aswathy (2015) in Kasthuri turmeric (*Curcuma aromatica* Salisb).

Among different potting media used in the experiment, p_3 (coir pith compost and vermicompost in the ratio of 3:1) or p_2 (normal top soil and coir pith compost in the ratio of 1:1) resulted in higher seedling sprouting compared to normal top soil as potting medium. However the p_3 was found to be performing better than other potting media with respect to shoot length, shoot biomass, root length and root biomass of minisett seedlings.

According to Reghuvaran and Ravidranath (2010), raising the seedlings in potting medium containing higher percentage of biodegraded coir pith produced higher shoot and root length in medicinal plants. The degraded or composted coir pith has the ability to store and release nutrients to plants for extended period of time and also has great oxygenation properties which are important for healthy root development (Prasath et al 2014). Similarly in a study Abirami et al (2010) indicated that vermicompost when added to coir dust improved the physical property and nutrient content of the medium. Further the addition of vermicompost in the potting medium was found to have a stimulatory effect on emergence and root growth of seedlings in case of tomato (Zaller 2007).

The combination of coir pith compost and vermicompost as potting medium therefore might have combined the positive effect of both the media which was reflected in the early growth attributes of cassava minisetts. Similar findings were reported by Aswathy (2015) in Kasthuri turmeric and Srinivasan and Srimathi (2016) in tomato. Among the interaction effects the m_2p_3 resulted in significantly higher shoot length (8.38 cm) and shoot biomass (4.69 g/seedling) at 3 WAP and root length at 3 (9.36 cm) and 4 (14.25 cm) WAP.

Table 2. Effect of type of minisett cuttings and potting media on length and biomass of cassava shoot and root

Treatment	Shoot, root length (cm) and biomass (g/seedling) at different weeks after planting (WAP)											
	Shoot length			Shoot biomass			Root length			Root biomass		
	3 WAP	4 WAP	5 WAP	3 WAP	4 WAP	5 WAP	3 WAP	4 WAP	5 WAP	3 WAP	4 WAP	5 WAP
Type of minisett cuttings (m)												
m_1	5.73	8.91	9.57	3.70	3.98	4.71	7.42	11.45	14.86	0.375	0.617	0.751
m_2	7.26	9.62	11.10	4.08	4.63	5.06	8.09	12.40	16.04	0.457	0.731	0.850
SEm±	0.133	0.177	0.172	0.108	0.064	0.039	0.158	0.173	0.317	0.019	0.025	0.033
$CD_{0.05}$	0.382	0.506	0.493	0.310	0.184	0.113	0.453	0.497	0.907	0.039	0.073	0.094
Potting media for the minisetts (p)												
p_1	5.96	8.49	9.93	3.53	4.07	4.73	7.06	11.32	14.92	0.346	0.566	0.721
p_2	6.38	8.86	9.92	3.79	4.29	4.78	7.60	11.45	15.37	0.386	0.664	0.778
p_3	7.15	10.45	11.15	4.21	4.57	5.13	8.60	13.01	16.06	0.516	0.793	0.903
SEm±	0.163	0.217	0.211	0.132	0.079	0.048	0.194	0.212	0.388	0.023	0.031	0.040
$CD_{0.05}$	0.468	0.620	0.604	0.379	0.226	0.138	0.555	0.608	NS	0.047	0.089	0.115
m × p interaction												
m_1p_1	5.36	7.80	9.06	3.44	3.67	4.57	7.07	11.51	14.03	0.297	0.511	0.670
m_1p_2	5.72	8.57	9.04	3.72	4.03	4.61	7.34	11.07	14.99	0.313	0.606	0.685
m_1p_3	5.92	10.36	10.60	3.92	4.25	4.94	7.85	11.78	15.56	0.513	0.735	0.899
m_2p_1	6.56	9.19	10.79	3.62	4.45	4.89	7.07	11.13	15.81	0.395	0.621	0.771
m_2p_2	6.83	9.15	10.80	3.92	4.56	4.95	7.85	11.83	15.75	0.450	0.723	0.871
m_2p_3	8.38	10.53	11.70	4.69	4.90	5.32	9.36	14.25	16.56	0.520	0.850	0.908
SEm±	0.231	0.306	0.298	0.187	0.112	0.068	0.274	0.300	0.548	0.023	0.044	0.057
$CD_{0.05}$	0.662	NS	NS	0.536	NS	NS	0.785	0.861	NS	0.067	NS	NS

NS: Non-significant

Table 3. Comparison of root number, length and biomass of cassava minisetts in nursery with normal setts in the main field under different treatments

Treatment	Root number, length (cm) and biomass (g/seedling) at different weeks after planting (WAP)								
	Number of roots			Root length (cm)			Root biomass (g/seedling)		
	3 WAP	4 WAP	5 WAP	3 WAP	4 WAP	5 WAP	3 WAP	4 WAP	5 WAP
m_1p_1	28.62	29.50	29.75	7.06	11.51	14.03	0.297	0.511	0.670
m_1p_2	29.62	29.87	29.87	7.34	11.07	14.99	0.313	0.606	0.680
m_1p_3	30.50	30.12	33.00	7.85	11.78	15.56	0.513	0.735	0.891
m_2p_1	31.12	31.25	31.25	7.07	11.13	15.81	0.395	0.621	0.772
m_2p_2	31.62	32.50	35.00	7.85	11.83	15.75	0.450	0.723	0.871
m_2p_3	33.50	35.25	36.00	9.36	14.25	16.56	0.520	0.850	0.908
Control (normal sett planting)	11.20	22.80	26.00	5.23	10.34	16.46	0.235	0.777	1.050

m: Type of minisett cuttings, p: Potting media for the minisetts

The m_2p_3 also recorded highest root biomass (0.520 g/ seedling) which was on par with m_1p_3 (0.513 g/ seedling) at 3 WAP.

A comparison of root initiation of cassava minisetts in nursery with normal setts planted at the same time in the main field is given in Table 3. Comparison of the mean values of number of roots produced per minisett seedling and normal setts indicated that when three-node minisett cuttings were raised in the potting medium containing coir pith compost and vermicompost in the ratio of 3:1 (m_2p_3), highest number of roots, root length and root biomass were observed in three and four weeks old seedlings. However when the seedling age was 5 weeks, the normal setts (control) were found to produce higher root biomass than the minisetts. In minisetts the sprouting and emergence of sprouts occurred within 5 days of planting whereas in normal sett planting it was delayed by 12-15 days.

The late emergence of adventitious roots and sprouting of normal setts in cassava was previously reported by Alves (2002). The early emergence of sprouts would have favoured the fibrous root production in case of minisetts due to early availability of photosynthates for root initiation. The early rooting characteristics of minisetts would have been further accentuated by the potting medium containing coir pith compost and vermicompost in the ratio of 3:1. The higher moisture retention capacity, porosity and nutrient status of coir pith have been reported by Nagarajan et al (1985). The favourable influence of coir pith compost when coupled with the root promoting effect of vermicompost (Lazcano et al 2009) would have resulted in higher root growth in comparison with normal setts planted directly in the field.

Thus in the present study it was found that raising three-noded minisett cassava cuttings in potting medium containing coir pith compost and vermicompost in the ratio of 3:1 in the nursery resulted in better initial growth attributes over normal sett planting in the main field and it was found to be technically viable nursery technique for minisett cassava cultivation.

REFERENCES

Abirami K, Rema J, Mathew PA, Srinivasan V and Hamza S 2010. Effect of different propagation media on seed germination, seedling growth and vigour of nutmeg (*Myristica fragrans* Houtt). Journal of Medicinal Plants Research **4(19):** 2054-2058.

Alves AAC 2002. Cassava botany and physiology. In: Cassava biology, production and utilization (RJ Hillocks, JM Thresh and AC Bellotty eds), CAB International, Wallingford, UK, pp 67-89.

Aswathy TS 2015. Rapid multiplication of Kasthuri turmeric (*Curcuma aromatica* Salisb) through minisett technique and nursery management. MSc (Agric) Thesis, Kerala Agricultural University, Thrissur, Kerala, India, 160p.

Ayankanmi T, Shiwachi H and Asiedu R 2005. Sprouting and yield of yam (*Dioscorea* spp) minisetts in relation to sett size, soil moisture and agro-ecology. Tropical Science **45(1):** 23-27.

Bridgemohan P and Bridgemohan RSH 2014. Effect of initial stem nodal cutting strength on dry matter production and accumulation in cassava (*Manihot esculenta* Crantz). Journal of Plant Breeding and Crop Science **6(6):** 64-72.

Lazcano C, Arnold J, Tato A, Zaller JG and Domínguez J 2009. Compost and vermicompost as nursery pot components: effects on tomato plant growth and morphology. Spanish Journal of Agricultural Research **7(4):** 944-951.

Nagarajan R, Manickam TS and Kothandaraman GV 1985. Manurial value of coir pith. Madras Agricultural Journal **72:** 533-535.

Prasath D, Vinitha KB, Srinivasan V, Kandiannan K and Anandaraj M 2014. Standardization of soil-less nursery mixture for black pepper (*Piper nigrum* L) multiplication using plug-trays. Journal of Spices and Aromatic Crops **23(1):** 1-9.

Reghuvaran A and Ravindranath AD 2010. Efficacy of biodegraded coir pith for cultivation of medicinal plants. Journal of Scientific and Industrial Research **69(7):** 554-559.

Srinivasan J and Srimathi P 2016. Standardization of seed treatment and potting mixture for production of tomato seedlings in portray nursery. International Journal of Science and Nature **7(3):** 669-673.

Zaller JG 2007. Vermicompost in seedling potting media can affect germination, biomass allocation, yields and fruit quality of three tomato varieties. European Journal of Soil Biology **43(1):** 332-336.