Journal of Root Crops
Indian Society for Root Crops
ISSN 0378-2409, ISSN 2454-9053 (online)
Journal homepage: https://journal.isrc.in

Performance of improved varieties of cassava in two agroecological units of Kerala

R. Muthuraj[1]*, James George[1], S. Sunitha[1] and M.N. Sheela[2]

[1]*Division of Crop Production, ICAR-Central Tuber Crops Research Institute, Sreekariyam, Thiruvananthapuram-695017, Kerala, India*

[2]*Division of Crop Improvement, ICAR-Central Tuber Crops Research Institute, Sreekariyam, Thiruvananthapuram-695017, Kerala, India*

Abstract

Cassava is an important source of energy in the diet of tropical countries of the world. It has enormous potential in India for food security and industrial uses due to its ability to grow in marginal and waste lands where other crops do not survive. Commercial planting of cassava is done from stem cuttings and because of the low multiplication rate as compared to cereals and pulses, the high yielding varieties released in the research institute takes many years to reach the farmers. Over the years, clonal multiplication degenerates the planting material, reduce tuber yield drastically and renders the cultivation of cassava uneconomical. An attempt was made to see the performance of improved varieties of cassava in Mattathur gram panchayat of Thrissur district which falls under Northern laterites Agro Ecological Unit 11 (AEU11) and Vellamunda panchayat of Wayanad district under Wayanad Central Plateau Agro Ecological Unit 21 (AEU21) of Kerala. The programme was implemented under the project on Development of Tuber Crops financed by Government of Kerala during 2014-15 and 2015-16 undertaken by ICAR-Central Tuber Crops Research Institute, Thiruvananthapuram, Kerala. Hundred farmers were selected from Mattathur Krishi Bhavan of Thrissur districtand fifty farmers from Vellamunda Krishi Bhavan of Wayanad district. Quality planting materials of improved varieties of cassava from ICAR-CTCRI *viz*., Sree Jaya, Sree Vijaya, Sree Pavithra, CTM 820 and CTM 806 were distributed to the farmers for cultivation in area of 10 cents of each, with a total areaof 6 ha. The cultivation of cassava was carried out under rainfed conditions with the guidance and the direct supervision of ICAR-CTCRI scientists. Farmers got an average tuber yield of 5.40 kg and 3.70 kg per plant with an average number of tubers 6.30 and 4.68 per plantin Mattathur and Vellamunda, respectively. Improved varieties of cassava produced significantly higher average tuber yield of 66.67 t ha^{-1} and 45.68 t ha^{-1} at Mattathur and Vellamunda, respectively. In both the locations, farmers could also produce 1.50 lakhs stems of improved varieties of cassava from 6 ha area within one season which were distributed to neighboring farmers and nearby districts for cultivation in an area of 60 ha.

Keywords: Cassava, quality planting material, multiplication, farmers

Introduction

Cassava is the fifth most important food crop in the world and was initially adopted as a popular famine reserve crop as it provided a more reliable source of food during drought and hunger. It has emerged as both staple food and profitable cash crop of industrial significance in the world economy (Aerni, 2006). Cassava has enormous potential in India for poverty alleviation, food security

* Corresponding author
Email: drmuthuraj29@yahoo.co.in; Tel: +91 9495306063

Received: 22 January 2021; Revised: 18 March 2021; Accepted: 10 April 2021

and industrial use due to its ability to grow and yield well in marginal and wastelands. The crop is propagated vegetatively resulting in a low multiplication rate (1:10). Difficulty in transporting the planting materials to distant places due to bulkiness of planting material and the cassava mosaic disease infection are the major hindrance which prevent the spread of the crop in non-traditional areas of the country. Cassava, with its versatility to adapt to varying soil, climate and edaphic conditions, stand out as unique to meet the food and fuel requirements of ever-increasing population. The ability to yield reasonably well under changing climatic conditions makes them the future crops. Inadequate availability of quality planting material of tuber crops continues to remain as a major stumbling block in the faster spread of high yielding varieties and their adoption by the farming community. Tuber crops are considered as insurance crops during the days of famine or natural calamity. In India, cassava is cultivated in an area of 0.183 million ha with a production of 6.94 million tonnes and the productivity in India is the highest (37.93 t ha^{-1}) globally (FAOSTAT, 2021). It is an important source of energyfor the millions of people in the tropical and subtropical parts of the world. (Yan et al., 2013). It produces more calories per unit area per unit time than any other crop. Cassava is mainly grown for its starchy tubers of edible and commercial value. It is an important source of starch and a component of animal, fish and poultry feeds (Abraham et al., 2006; George et al., 2011). Moreover, it is also used in various industries including starch and starch-derived products such as sago, textile, alcohol and high fructose-glucose syrups (Joseph et al., 2004; Yan et al., 2013). The present study was carried out with the objective of assessing the performance of improved varieties of cassavain two districts of Kerala along with multiplication of planting materials.

Material and Methods

Performance of improved varieties of cassavawas studied at two distinct panchayats of Kerala. Mattathur gram panchayatof Thrissur districtlies under Northern laterites Agro Ecological Unit 11 (AEU 11). This AEU area the climate is tropical humid monsoon type with mean annual temperature 27.5°C and rainfall ranging from 2795 to 3217 mm, laterite soils are the most extensive in the unit covering almost entire midlands. Vellamunda panchayat of Wayanad district of Kerala comes under Wayanad Central Plateau Agro Ecological Unit 21 (AEU 21). The climate is tropical humid monsoon type with mean annual temperature of 22.6°C and rainfall 2659 mm, upland soils are deep, acid clays and rich in organic matter and are suitable for cassava cultivation. The programme was implemented through Mattathur Krishi Bhavan of Thrissur district and Vellamunda Krishi Bhavan of Wayanad district of Kerala during 2014-15 and 2015-16 under the project on Development of Tuber Crops in the State of Kerala which was undertaken by ICAR-Central Tuber Crops Research Institute, Thiruvananthapuram, Kerala funded by the Department of Agriculture, Government of Kerala. The quality planting materials of improved varieties of cassava *viz*., Sree Jaya, Sree Vijaya, Sree Pavithra, CTM 820 and CTM 806 were distributed to farmers for planting in an area of 10 centsper each beneficiary, and thus covering a total area of 6 ha. A total of 100 farmers from Mattathur Krishi Bhavan area and 50 farmers from Vellamunda, Krishi Bhavan area were selected. Four skill-based training programme on scientific cultivation practices including large scale production of planting materials of cassava, agro techniques, organic farming, minisett quality planting material production (James George et al., 2004), seed treatment, value addition, plant protection measures, harvesting and seed certification standards were organized. Scientists and experts of ICAR-Central Tuber Crops Research Institute, Thiruvananthapuram visited the farmers' fields periodically and given technical advice on intercultural operations, remedial measures for incidence of pest and disease, rouging of off types and disease infected plants etc. The yield data were recorded at the time of harvest.

Result and Discussion

Based on random sampling, an average cassava tuber yield of 66.67 t ha^{-1} was recorded at Mattathur panchayat area. Cassava tuber yield varied from 2.50 to 12.0 kg per plant at Mattathur with an average tuber yield of 5.40 kg per plant. Number of tubers ranged from 3 to12 per plant with an average of 6.30per plant at Mattathur panchayat area (Table1 and Fig. 1).

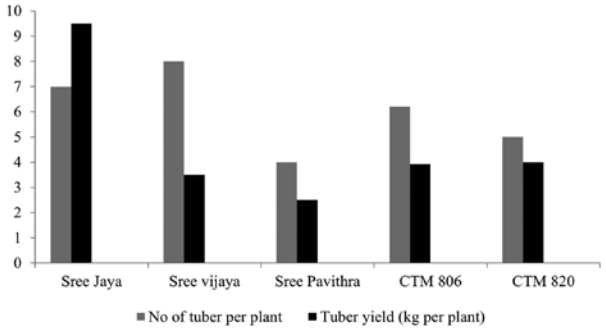

Fig. 1. Tuber yield and number of tubers per plant for different cassava varieties at Mattathur

Based on random sampling, improved varieties produced higher average tuber yield of 66.67 t ha^{-1} by improved varieties along with better intercultural management conditions in Mattathur panchayat. The farmers got an average tuber yield ranging between 2.0 to 5.7 kg per plant and number of tuber 2-8 per plant with an average yield of 3.70 kg per plant and average tuber number of 4.67 per plant and total tuber yield 45.68 t ha^{-1} at Vellamunda, Krishi Bhavan area of Wayanad district (Table 2 & Fig. 2)

Table 1. Yield Performance of cassava varieties in the farmers' field at Mattathur panchayat, Thrissur

Sl. No.	Name of the farmer	Name of the village	No. of tubers plant $^{-1}$	Tuber yield (kg plant^{-1})	Variety
1.	Ms. Sarada	Vellikulangara	7	12.0	Sree Jaya
2.	Mr. Asokan	Kodali	7	7.0	Sree Jaya
3.	Mr. Satheesan	Mattathurkunnu	6	4.2	CTM 806
4.	Mr. Sukumaran	Mattathurkunnu	5	4.0	CTM 820
5.	M. Sukumaran	Mattathurkunnu	12	4.5	Sree Vijaya
6.	Ms. Ajithakumari	Chettichal	4	2.5	Sree Vijaya
7.	Ms. Jayalekshmi	Chettichal	6	3.5	CTM 806
8.	Ms. Mary	Padi	3	2.5	Sree Pavithra
9.	Mr. Sooraj	East Kodali	7	4.0	CTM 806
10.	Mr. Shajahan	Padi	6	4.0	CTM 806
		Mean	6.3	5.4	

*Mean number of tuber per plant - 6.3, Mean tuber yield per plant - 5.4 kg
Average tuber yield per ha - 66.67 t ha^{-1}, Average tuber yield per unit area - 2,666 kg (0.10 acre)

Table 2. Yield Performance of cassava varieties in the farmers' field at Vellamunda Panchayat, Wayanad district

Sl.No	Name of the farmers	Name of the village	No. of tubers plant^{-1}	Tuber yield (kg plant^{-1})	Variety
1.	Mr. Santha Ajeesh	Nellicachal	6	4.500	Sree Jaya
2.	Mr. Ravi	Nellicachal	4	3.000	Sree Jaya
3.	Mr. Lekshmi	Nellicachal	4	2.500	Sree Jaya
4.	Mr. Kurumbi	Nellicachal	5	3.500	Sree Vijaya
5.	Mr. Chandran	Karakkamala	3	2.000	Sree Vijaya
6.	Mr. Ratheesh	Nellicahal	6	3.000	Sree Jaya
7.	Mr. Mallan	Karakkamala	3	2.000	Sree Jaya
8.	Mr. Balakrishnan	Karakkamala	2	1.600	Sree Jaya
9.	Mr. Santha	Karakkamala	6	5.700	Sree Jaya
10.	Mr. Korumbi	Karakkamala	5	4.800	Sree Pavithra
11.	Mr. Balan	Karakkamala	8	4.000	Sree Pavithra
12.	Ms. Leela	Karakkamala	4	3.000	Sree Jaya
		Mean	4.67	3.70	

*Mean number of tubers per plant - 4.67, Mean tuber yield per plant - 3.70 kg,
Average tuber yield per ha - 45.68 t ha^{-1}, Average tuber yield per unit area - 1,850 kg (0.10 acre)

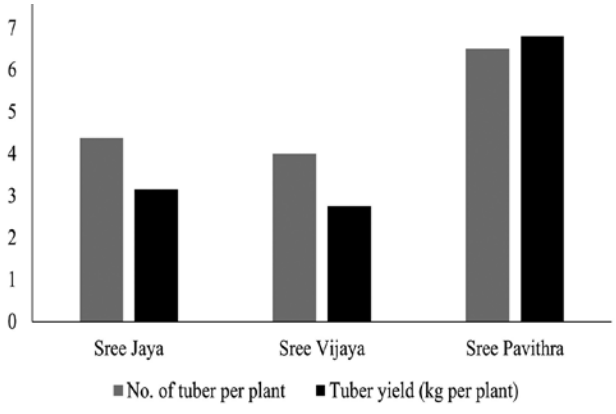

Fig.2. Tuber yield and number of tubers per plant for different cassava varieties at Vellamunda

In general, performance of improved varieties of cassava was better in AEU 11and there was a decline in tuber yield by 31% in AEU 21. Sree Jaya performed better in location (12 kg plant^{-1})followed by Sree Vijaya (4.5 kg plant^{-1}). The low temperature prevailed during the cultivation at Wayanad might be the major reason for the lesser yield.Taking into consideration the cost of cassava stems, transportation, field preparation, planting and other related expenses, the total cost of cultivation was estimated as ₹8000 for an area of 10 cents. However, planting materials and cultivation cost expenses were distributed to beneficiary farmers from ICAR-CTCRI, Thiruvananthapuram under the 'Development of tuber crops' scheme. On average, farmers got tuber yield of 5.40 kg per plant at Mattathur panchayat in

Thrissur district. In the case of Vellamunda panchayat of Wayanad district, farmers got an average yield of 3.70 kg per plant. At the time of harvesting, tuber price in the local markets was 15-20 per kg. Average B:C ratio was worked out as 4.64:1 at Mattathur and 3.63:1 at Vellamunda (Table 3).

Table 3. Economics of cassava cultivation in farmers' field (0.10 acre)

Item	Mattathur	Vellamunda
Cultivation expenses including cost of planting materials (₹)	8,000	8,000
Tuber yield, kg (0.10 acre)	2670	1850
Gross returns 20 per kg for tuber	53400	37,000
Net return@ ₹	45400	29,000
B:C Ratio	6.67:1	4.63:1

Conclusion

The improved varieties of cassava were raised based on the ICAR-CTCRI package of practices given to farmers in the training programme.The results revealed that the average yield was higher in Mattathur (66.67t ha^{-1}) as compared to Wayanad (45.68 t ha^{-1}). The average tuber yield was 66.67 t ha^{-1} and 45.68 t ha^{-1} in Mattathur and Vellamunda panchayat, respectively. Accordingly, the net income benefit-cost ratio from cassava crop was 6.67:1 in the Mattathur panchayat of Thrissur district and 4.62:1 in the Vellamunda panchayat of Wayanad district of Kerala. Due to implementation of this programme, farmers got sufficient good quality planting material of cassava which is fast spreading in the neighborhood area and increased the income generation from cassava. Farmers could produce 1.50 lakhs cassava stems of improved varieties of cassava from 6 ha area within one season which were distributed to neighbourhood farmers for cultivating in an area of 60 ha.

References

Aerni, P. 2006. Mobilizing science and technology for development: The case of the Cassava Biotechnology Network. *Ag. Bio. Forum*, **9**(1):1-14.

FAOSTAT 2021. Food and Agricultural Organization of the Unit Nations, Rome, Italy, Available at https://www.fao.org/faostat/en/#data/qcl.

Farm Guide 2022. Agriculture Development and Farmers Welfare Department, Farm Information Bureau, Government of Kerala. Farm Guide Book.

James George, Shyam S. Nair and Sreekumari, M.T. 2004. Rapid multiplication of planting materials in tuber crops, Central Tuber Crops Research Institute, Thiruvananthapuram, Kerala, India November 2004. 36 p.

KAU.1996. Package of Practices, Kerala Agricultural University, Directorate of Extension, Mannuthy, Kerala, India.

Yan,H., Lu, L., Hershey,C., Ceballos, H.,Chen, S. and Li, K. 2013. Cassava mutation breeding: current status and trends. *Pl. Mutation Rep*., **3**(1):37-44.

Abraham,K., Edison,S., Unnikrishnan M., Sheela, M.N., Vimala, B, Sreekumari M.T. and Naskar, S.K. 2006. Tuber crops varieties released by the Central Tuber Crop Research Institute, Sreekariyam, Thiruvananthapuram, Kerala, India.

George,J., Suresh kumar, P. and Unnikrishnan,M.2011. Description of recommended/released varieties under AICRP on Tuber Crops,Technical bulletin series No 51. All India Coordinated Research Project on Tuber Crops, ICAR-CTCRI, Thiruvananthapuram.

Joseph,R., Yeoh, H.H and Loh, C.S. 2004.Induced mutations in cassava using somatic embryos and the identification of mutant plants with altered starch yield and composition. *Pl. Cell Rep.*, **23**:91-98.