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Potentiality of Colocasia Intercrop Under Naturally Occurring Palmyra Palm (*Borassus flabellifer L.*)

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ABSTRACT

The study was conducted with five replications in Randomized Block Design (RBD), which consist of four tree density treatments viz. T_1: 16 palmyra trees, T_2 : 23 palmyra trees, T_3 : 29 palmyra trees and T_4 : 41 Palmyra trees and T0 : Control/ Open plot. In each plot tuber crop Taro *(Colocasia esculenta)* was grown. Leaves of Colocasia per plot (5147.67) and BCR (1:6.56) were registered significantly maximum when grown under highest density of Palmyra palm and it gradually decreased with decrease in density of palmyra palm. Fruit and Neera yield of palmyra palm (326.08 kernels/plant and 4.08 l/plant, respectively) were higher in least density of palmyra palm.

INTRODUCTION

Palmyra Palm *(Borassus flabellifer)*, toddy palm, or sugar palm, is native to the Indian subcontinent and Southeast Asia, including Nepal, India, Bangladesh, Sri Lanka, Cambodia, Laos, Burma, Vietnam, Malaysia and Indonesia. It is a robust tree of Arecaceae family and can live more than 100 years and reach a height of 30 meters, with a canopy of green-bluish leaves with several dozen fronds spreading 3 m across. Young Palmyra palms grow slowly in the beginning but then grow faster with age. There are separate male and female trees. Male and female inflorescences are tapped to produce a sweet sap (Dalibard 1999). The ripened fibrous outer layer of the palm fruits can also be eaten raw, boiled, or roasted. (Bayton 2009). The Palmyra leaves are used for thatching, mats, baskets, fans, hats, umbrellas, and as writing material. In Indonesia the leaves were used in the ancient culture as paper, known as "lontar". The stalks of Palmyra are used to make fences and also produce a strong, wiry fiber suitable for cordage and brushes (Bayton 2009). The sap obtained traditionally involves tapping the male inflorescence and collecting the dripping juice in hanging earthen pots. The juice so collected before morning is refreshing and light drink called Neera. A sugary sap called toddy or Neera in Gujarati can be obtained from the young inflorescence, either male or female. It is reported by Dakshin Gujarat (India) Neera Tadgud Gramodhyog Sangh that there are near about 50000 trees of Palmyra palm in different parts of Gujarat with variation of 600 to 2000 fruits per tree and 7 liters to 20 liters of Neera per tree per day in different trees which shows that with proper scientific management higher yield can be obtained. From the data it was observed that economic value from each palm per year is around Rs. 5000/- without any inputs (Patel and Pathak 2016). Growing of tuber crops in agroforestry systems not only cater house hold requirements of farmers, but also provides employment for labour round the year (Mathew et al. 2008). Looking to the

proliferation of naturally found Palmyra trees in the areas of south Gujarat, agroforestry model with Palmyra palm can enhance livelihood upliftment. The present study was carried out with the aim to study the influence of density of Palmyra palm on yield potential of *Colocasia esculenta*.

MATERIAL AND METHODS

The present investigation was conducted during the year 2015-2016 at Dakshin Gujarat Neera Tadgud Gramodhyog Sangh, Dedvasan, Ta. Mahua, Dist. Surat, India. The site is situated about 60 km away from Surat and 25 km from Navsari. The site is at 20°58' North latitude and 72° 54' East longitudes. The study was conducted with 5 replications in Randomized Block Design (RBD), which consist of 4 tree density treatments in per plot: 16 palmyra trees (T_1), 23 (T_2), 29 (T_3) and 41 palmyra trees (T_4) and control/ open plot (T0). In each plot tuber crop V1-Taro (*Colocasia esculenta*) were grown. Size of each plot was 25 X 20 m. Observations leaves of colocasia per plot, leaves per hectare, number of fruits per plant, neera liters per day of palmyra palm and economics of colocasia crops grown under different density of palmyra palm was worked out data was analysed as per methods prescribed by Panse and Sukhatme (1967).

RESULT AND DISCUSSION

The data presented in Table 1 revealed that leaves of colocasia per plot and per hectare was observed significantly maximum in T_4 (5147.67 and 3,21,714.50, respectively) when density of Palmyra palm was highest which was followed by the treatment T_3 (4618.83 and 2,88,710.33, respectively) where slightly lower density of Palmyra palm as compared to T_4. The yield of Colocasia gradually decreased as the density of Palmyra palm decreased. However, leaves of colocasia per plot and per hectare were observed significantly maximum in the plot with highest density of Palmyra palm. This is due to shade loving nature of colocasia which allowed the plant to grow best in the maximum available shade condition. Similar results were found by Nilanjana et al. (2003), Bisht et al. (2004), Sanou et al. (2012), Pouliot et al. (2012), However fruit yield of Palmyra palm (326.08 kernels/plant and 4.08 liters per day) were noted significantly maximum in T1 where least density of Palmyra palm. Moreover minimum fruit yield (251.67 kernels per plant and 3.17 liters per day) were noted in T4 where density of palm is highest (Table 1). The fruits and Neera yield per plant were maximum in the plot where the density of trees is least. This may be due to density effect on trees which allowed trees to have less competition for light and soil nutrients. Hence, the least dense plot yields the maximum due to effect of density. The same results were recorded by Chattopadhyay et al. (2006), Maheswarappa (2008), Banerjee et al. (2009), Jessy et al. (2013), Rathore et al. (2013) and Hore et al. (2015). The data with respect to benefit cost ratio are presented in Table – 2. It is evident from data presented in table that in case of intercropping with Palmyra palm, the highest BCR was registered when Colocasia was grown in highest density of Palmyra palm (1:6.56). This might be due to the fact Colocasia crop are shade loving or secondly it might be due to the additional income of Palmyra palm. The same results were recorded by Hegde and Sulekeri (2001), Hore et al. (2007), Lamanda et al. (2008), Venkatesh and Nagarajaih (2010) and Datta et al. (2011).

Table 1. Leaves of colocasia per plot and hectare as influenced by density of Palmyra Palm and variations in Number of fruits and neera per plant of Palmyra Palm

Trees Density	Leaves of Colocasia /plot	Leaves of Colocasia ha^{-1}	Number of fruits/plant	Neera (liters per plant)
T_0	3665.33	2,28,466.67	-	-
T_1	4143.67	2,59,012.50	326.08	4.08
T_2	4494.00	2,80,841.67	324.42	3.42
T_3	4618.83	2,88,710.33	279.42	3.33
T_4	5147.67	3,21,714.50	251.67	3.17
S. Em+	105.803	6652.444	5.387	0.125
C. D. @ 5 %	312.13	19625.04	15.51	0.36
C.V. %	6.56	6.60	6.62	12.87

Table 2. Economics of Colocasia crops grown under different density of Palmyra palm

Treatments	Yield (Leaves/ha)	Fixed Cost (Rs ha^{-1})	Variable Cost (Rs ha^{-1})	Total Cost (Rs ha^{-1})	Gross Realization (Rs ha^{-1})	Palm realization (Rs ha^{-1})	Total Realization (Rs ha^{-1})	Net Realization (Rs ha^{-1})	BCR
T_0	228466.67	43467	37050	80517	228466.67	0.00	228466.67	147949.67	1.84
T_1	259012.50	43467	37050	80517	259012.50	185868.00	444880.50	364363.50	4.53
T_2	280841.67	43467	37050	80517	280841.67	242962.75	523804.42	443287.42	5.51
T_3	288710.33	43467	37050	80517	288710.33	254783.25	543493.58	462976.58	5.75
T_4	321714.50	43467	37050	80517	321714.50	287095.00	608809.50	528292.50	6.56

CONCLUSION

The yield parameters and Benefit Cost ratio of colocasia were registered significantly maximum where the density of Palmyra palm was highest and it gradually decreased with decrease in density of Palmyra palm. The maximum number of fruits and neera yield of Palmyra palm were registered where the density of Palmyra palm was lowest and it was gradually decreased with increase in density of Palmyra palm.

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