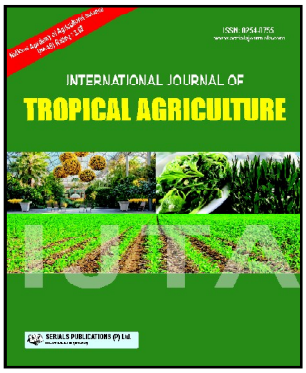

INTERNATIONAL JOURNAL OF TROPICAL AGRICULTURE

ISSN : 0254-8755

available at http: www.serialsjournal.com

Volume 35 • Number 2 • 2017

Tree Growth and Forage Productivity in Tamarind (*Tamarindus Indica* L.) Based Hortipasture System

AK Shukla[1*] and Sunil Kumar

Indian Grassland and Fodder Research Institute, Gwalior Road, Jhansi-336004
[1]Indian Agricultural Research Institute, Regional Station, Amartara Cottage, Shimla-171004
[*]Corresponding author. E-mail: akshuklahort@gmail.com

Abstract: Performance of tamarind (DTS-1 and DTS-2) with respect to tree growth and forage yield was assessed from 2008 to 2013 at ICAR-IGFRI, Jhansi under different moisture conservation treatments. The plot size was 12 m × 36 m having 12 trees/plot with the spacing of 6 m × 6 m. The understorey of each plot was intercropped with pasture *viz; Cenchrus ciliaris* + *Stylosanthes seabrana*. During the fouth year tree height varied from 1.86-2.13m with maximum in staggered trenches (2.13 m. Collar diameter ranged from 4.67-5.70 cm with maximum in Black polythene (5.70 cm) and minimum in control (4.67 cm). Tree canopy was varied from 1.59-1.95 m with maximum in staggered trench (1.95 m). Tamarind variety DTS-2 (2.15 m, 5.65 cm, 1.81 m) performed better with respect to height, CD and canopy spread as compared to DTS-1 (1.92 m, 4.80 cm, 1.71 m). Forage production was significantly affected by different moisture conservation treatments and it was varied from 4.62-6.32 t DM/ha with maximum in staggered trenches (6.32 t DM/ha) and minimum forage yield was recorded in control (4.62 tDM/ha). There was no significant effect of varieties on forage production however the maximum forage yield was recorded with the variety DTS-1 (5.51 tDM/ha) than variety DTS-2 (5.32 tDM/ha).

INTRODUCTION

Hortipasture system is found to be economically viable alter-native land use system for class V and VI. It can supply the protective food (fruit) for human being and fodder for animal and thus help in bridging the wide gap between the supply and demand of fruit and fodder. However, the success of developing hortipasture land use system depends largely on selection of fruit plants, pasture species. Sole crop production under fragile agro-ecosystem

is highly unstable due to edapho-climatic constraints (Shukla and Kumar, 2007, Raturi and Hiwale, 1993). The compatible combination of fruit trees and grass and legume would be one of the efficient ways to satisfy human need and cattle hunger. Tamarind, (*Tamarindus indica* L.) is an underutilized fruit crop belongs to the family Leguminosae. It is a multipurpose tropical fruit species primarily used for its fruits, which are eaten fresh or processed, used as a seasoning or spice, or the fruits and seeds are processed for non-food uses. Tamarind seed kernel powder (TKP) is a major industrial product, which is used in the sizing of textile, paper and jute. Water is a critical input in semi-arid situation.

Survival of Tree and grasses can be enhanced by adopting different moisture conservation strategies including shaping the surface in the vicinity of the trees to collect runoff water near the root zone. However, *in-situ* moisture conservation has a great potential particularly in semi-arid region for obtaining the optimum productivity of the system. The basic objective to adopt moisture conservation practices was to provide regular moisture for longer period of growth and development of trees. Ever increasing human and livestock population coupled with the over exploitation of available natural resources created an imbalance between demand and supply of green and dry fodder. The requirement of dry and green fodder by 2025 AD 1170.8 mt and 650.4 mt respectively, while supply is expected around 411.3 mt and 488 mt. The deficit will be 64.87% green fodder and 24.92 dry fodder. In view of fodder shortage and limitation to expand the area under fodder cultivation on account of demographic pressures, the effective utilization of interspaces of new plantations offer a unique opportunity to mitigate the fodder shortages up to greater extent. Due to poor, erratic rainfall and low organic carbon in soil majority of fruit species have low survival rate after few month of planting. However, *in-situ* moisture conservation has a great potential particularly in semi-arid region for obtaining the optimum. To assess the performance of *tamarind* based hortipastoral system under different moisture conservation practices and to know the suitability and profitability aspects of tamarind with perennial pasture as intercrop under rainfed condition.

MATERIALS AND METHODS

Study was conducted at Central Research Farm of ICAR-Indian Grassland and Fodder Research Institute, Jhansi from 2008 to 2013. Experimental site is situated between latitude 24°11′-26° 27′ N and longitude 78°17-81°34 at about 275 m above mean sea level. The climate of Jhansi is semi arid with the occurrence of recurrent drought. The soil of experimental site is red. Plot size is 12 × 36 m with twelve number of plant in each plot. Two varieties of Tamarind namely DTS-1 and DTS-2 were transplanted during 2008 at 6 × 6 m spacing under square system of planting. The understorey of each plot was intercropped with perennial pasture (*Cenchrus ciliaris* and *Stylosanthes seabrana*).

The new seedlings of *Cenchrus ciliaris* were transplanted during July-August, 2009 at 100 × 50 cm and *Stylosanthes seabrana* seed @ 4 kg /ha were sown in line between 2 rows of grass under Tamarind tree and similar practice was adopted for pure pasture block. 15 kg FYM and 100 g N, 75g P_2O_5 and 100 g K_2O applied to each tree during first year and it was increased every year in same proportion (upto 10^{th} year). For pasture 20 kg N and 30 kg P_2O_5 and 30 kg K_2O/ha of fertilizers were applied each year. Tree diameters was measured with vernier calliperse and length was recorded with iron rod. The experiment consist of six treatments *viz*; T_1 Staggered trenches, T_2 Black Polythene mulch T_3 Staggered pitting in 4 directions, T_4 Control (without moisture conservation), T_5 Sole tamarind, T_6 Sole pasture. Each treatment was replicated thrice in randomized block design.

RESULTS AND DISCUSSION

Tree Growth

Data on tree growth and forage yield presented in table 1 reveals that tree height varied from 1.86-2.13m with maximum in staggered trenches (2.13 m), closely followed by Sole tamarind (2.11 m), Black polythene mulch (2.06 m) and minimum was recorded in control (1.86 m). Collar diameter ranged from 4.67-5.70 cm with maximum in Black polythene (5.70 cm) followed by staggered trench (5.15 cm), sole tamarind (5.13 cm) and minimum in control (4.67 cm). Tree canopy was varied from 1.59-1.95 m with maximum in staggered trench (1.95 m) which was followed by black polythene mulch (1.77 m), staggered pitting in 4 direction (1.74 m) and minimum was recorded in control (1.59 m). Tamarind variety DTS-2 (2.15 m, 5.65 cm, 1.81 m) performed better with respect to height, CD and canopy spread than DTS-1 (1.92 m, 4.80 cm, 1.71 m). Relatively enhanced tree growth was also reported under in-situ moisture conservation practices by Kumar and Shukla (2010) in ber, Shukla *et.al* (2006) in aonla.

Forage Production

Forage production was significantly affected by different moisture conservation treatments and it was varied from 4.62-6.32 t DM/ha with maximum in staggered trenches (6.32 t DM/ha) followed by staggered pitting in 4 direction (5.71 tDM/ha), Black polythene mulch (5.58 tDM/ha) and minimum forage yield was recorded in control (4.62 tDM/ha). There was no significant effect of varieties on forage production however the maximum forage yield was recorded with the variety DTS-1 (5.51 tDM/ha) than variety DTS-2 (5.32 tDM/ha). Through *in-situ* moisture conservation, there was regular moisture regime in the root zone of pasture which has enhanced total biomass production. Kumar *et.al* (2009) have also reported that highest forage production *i.e.* > 7.0 tDM/ha in aonla through *in-situ* moisture conservation. Shukla *et al* (2014) also reported similar results in bael.

Table 1
Growth and forage yield of tamarind based hortipastoral system

	Tree growth			
Treatment (Moisture conservation)	*Height (m)*	*Collar diameter (cm)*	*Canopy (m)*	*Forage yield (tDM/ha)*
T_1	2.13	5.15	1.95	6.32
T_2	2.06	5.70	1.77	5.58
T_3	2.03	4.98	1.74	5.71
T_4	1.86	4.67	1.59	4.62
T_5	2.11	5.13	1.73	–
T_6	–	–		5.18
CD (P = 0.05)	0.15	0.19	0.11	0.22
Varieties (Tamarind)				
DTS-1	1.92	4.80	1.71	5.51
DTS-2	2.15	5.65	1.81	5.32
CD (P = 0.05)	NS	NS	NS	NS

T_1 Staggered trenches, T_2 Black polythene mulch, T_3 Staggered pitting in 4 directions T_4 control (without moisture conservation), T_5 sole Tamarind and T_6 sole pasture

REFERENCES

Raturi G.B. and Hiwale S.S. (1993), Horti-silvi-pastoral system for increased productivity of marginal and degraded lands under rainfed condition. *Advances in Horticulture and Forestry* **3**: 179-186

Shukla A.K. and Sunil Kumar (2007), Prospect of underexploited fruit for crop diversification through hortipastoral system under semi arid region. *Range Mgmt and Agroforestry* **28**(20): 421-422.

Kumar Sunil, Shukla A.K, Singh Ramesh, Tiwari S and Rai AK (2009), Establishmenyt of hortipasture system in drought through soil and water conservation measure. *IGFRI Newsletter* **15**(4): 6.

Kumar S. and Shukla AK (2010), Improvement of 13 year old plantations of ber through bunding and micronutrients (Boron and Zinc) management. *Indian J. Hort.* **67**(3): 322-327

Shukla A.K, Singh D Meena S.R. Singh I.S., Bhargava, R, and Dhandar D.G. (2006), Enhancement of water use efficiency in aonla through double ring system of irrigation under hot arid agro ecosystem. In National Symposium on Input use Efficiency in Horticulture 9-11 August 2006 at IIHR Bangalore. Pp99.

Shukla, AK , Sunil Kumar, SN Ram, HV Singh, Santosh G Watpade and KK Pramanick (2014), Bael (*Aegle marmelos*) Based Hortipastoral System with Moisture Conservation in Semi Arid Condition. *Journal of Tree Science*, **33**(1): 7-11.