



**DETERMINING THE FRUIT YIELD OF *JATROPHA CURCAS* L.
ACCESIONS FOUND IN HILLY ZONE AND SOUTHERN TRANSITION
ZONE OF CHIKKAMAGALURU AND SHIVAMOGGA DISTRICTS OF
KARNATAKA, INDIA**

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Abstract

Jatropha curcas L. is the more vigorous candidate for biodiesel production. The current work focuses on systematic measuring of fruit yield of *J. Curcas* per meter of live fence. The present work area is delineated into two zones- 1. Southern Transition Zone (STZ), 2. Hilly Zone (HZ). 31.00±5.240 is the mean number of fruits per meter of live fence. Within HZ 20.667±10.676 was the mean value obtained. Variation found within the HZ for this parameter was significant at 5 % level. The Mean Value of over 30 fruits per meter of live fence for Southern Transition Zone was recorded in STJCA1, STJCA5 and for Hilly Zone in STJCA4, STJCA8. The soil samples of areas of the respective accessions (SA1, SA5, SA4, and SA8) showed optimum to high Organic carbon and Nitrogen availability. On the other hand low Mean yield of less than 10 fruits per meter of live fence was observed in STJCA10 and STJCA6. The soil samples of the areas belonging to these two accessions showed low Organic carbon and Nitrogen availability. Compared to accessions of HZ, STZ accessions showed better fruit yield with less Annual Rainfall. This indicates *Jatropha curcas* being drought resistant crop could do better in general in semi arid regions compared to wet climate.

Key words – *Jatropha curcas*, STZ, HZ, STJCA1-STJCA12, yield, organic carbon, Nitrogen.

Introduction

During 15th century, the Portuguese introduced the *Jatropha* to Asian and African continents. *Jatropha curcas* L. is a drought resistant shrub/tree belonging to the family Euphorbiaceae (Heller *et al.*, 1996). In recent past *J. curcas* L. has been considered as a potential biodiesel crop in more than 50 countries. The reason being *Jatropha* biodiesel oil conforms to the International standards (Bamgboye and Hansen, 2008). According to (Fairless, 2007) there are more than 2.5 million hectares of *J. curcas* planted in India and China alone. Even after such interest being shown in the large-scale cultivation of *J. curcas*, characterization and conservation of genetic resources remain poor (Halilu *et al.*, 2011). Therefore in the present study attempts are made for to characterize *J. curcas* germplasm by estimating the fruit yield of accessions found in Chikkamagaluru and Shivamogga districts of Karnataka, India.

Materials and Method

Study Area: The study area selected includes taluks of Chikkamagaluru and Shivamogga districts (Table 1) which broadly falls under Southern Transition Zone (STZ) and Hilly Zone (HZ). The field trip was undertaken from the month of June to September, 2017.

Fruit Yield per meter of live Fence

As per Rekha *et al.* (2013) the Fruit set had the highest positive direct path towards seed yield/plant. In our study we had adopted modified method of [6] for measuring the yield of hedge crop - *Jatropha curcas*. The yield was measured by counting the number of ripened fruits per meter of live fence. A measuring tape was laid along the fence and for every one meter counting was done (Henning, 1996). The measuring was done thrice during the peak season i.e. June to September. Meanwhile soil samples of the respective collection sites were collected and later sent to Leaf Analysis Laboratory, Bioscience Centre, Horticulture Department, Government of Karnataka, Shivamogga for analysis.

The data's related to weather was obtained from the website maintained by Karnataka State Natural Disaster Monitoring Centre, A registered society of Government of Karnataka (Table 1). The data's pertaining to results was subjected to ANOVA using software XLSTAT 2017.5.47365 version.

Results and Discussion

Fruit yield per meter of live fence (Table 2) –

STJCA1, STJCA3, STJCA5 and STJCA11 all belonged to Southern Transition Zone (STZ). Within

STZ the mean value obtained for the parameter number of fruits per meter of live fence was 31.00 ± 5.240 . The minimum number obtained was 23 in STJCA3 and maximum was found in STJCA5 (40). The variation found within STZ was significant at 5% level. The post hoc analysis also exhibited significant variations between STJCA5 and STJCA3.

In HZ the maximum number of fruits per live fence was recorded in STJCA4 and STJCA8 (36). The

minimum value obtained was 04 in STJCA10. The mean value obtained was 20.667 ± 10.676 . At 5 % level significant variation was found within the HZ for this parameter. The post hoc analysis demonstrated significant variations between STJCA9 and all other accessions of HZ. Between STJCA4 and STJCA8, STJCA6 and STJCA10 there was not any significant variations.

Table 1 : Meteorological and soil analysis details [Source: <https://www.ksndmc.org>]

Zone	Place	Accessions	Soil sample	Meteorology (Mean Annual)			Soil analysis				
				Rainfall (mm)	Humidity	Temperature	OC	N	P	K	pH
STZ	Shivapura, Tarikere	STJCA1	SA1	773.81	63.44	25.29	0.85	308.448	13.51	186.54	6.11
	Shivamogga, Shivamogga	STJCA3	SA3	780.78	67.22	26.62	1.02	370.1376	1.86	50.66	6.31
	Churchagundi, Shikaripura	STJCA5	SA5	807.7	66.97	26.50	1.38	500.744	5.49	570.25	6.85
	Hunasekatte, Bhadravathi	STJCA11	SA11	794.52	71.35	25.58	0.81	293.9328	4.54	242.86	6.42
HZ	Kaimara- N R Pura	STJCA2	SA2	1250.16	67.83	25.90	1.06	384.6528	5.8	583.96	6.54
	Tawanandi, Soraba	STJCA4	SA4	1075.18	71.93	25.90	1.72	624.1536	2.74	114.37	6.37
	Ikkeri, Sagara	STJCA6	SA6	1312.93	73.78	25.86	0.63	228.6144	1.47	149.99	6.55
	Badavanadinne, Mudigere	STJCA7	SA7	1497.44	72.18	19.94	0.69	250.3872	4.01	247.69	6.44
	Halsabalhu, Chikkamagaluru	STJCA8	SA8	1195.08	64.80	25.42	1.46	529.8048	2.85	359.65	6.33
	Batanijaddu, Hosanagara	STJCA9	SA9	2206.38	76.51	25.21	1.39	504.4032	2.64	289.36	6.17
	Kudregundi, Koppa	STJCA10	SA10	2030.99	74.12	26.19	0.5	181.44	14.67	203.75	7.99
	Gundibylu, Thirthahalli	STJCA12	SA12	2619.24	69.03	27.19	1.15	417.312	10.94	43.81	5.87

For the same data interaction between the STZ and HZ found significant variation at 5% level. The Mean value obtained for the said parameter among all the accessions was 24.111 ± 10.389 .

The Mean Value of over 30 fruits per meter of live fence for Southern Transition Zone was observed in STJCA1, STJCA5 and for Hilly Zone in STJCA4, STJCA8. The soil samples of areas of the respective accessions (SA1, SA5, SA4, and SA8) showed optimum to high Organic carbon and Nitrogen availability (Table 1).

Table 2 : Fruit yield per meter of live fence

Accession → Replication ↓	STZ				HZ								
	STJCA 1	STJCA 3	STJCA 5	STJCA 11	STJCA 2	STJCA 4	STJCA 6	STJCA 7	STJCA 8	STJCA 9	STJCA 10	STJCA 12	
R1	31	26	38	29	22	34	6	16	34	29	6	19	
R2	33	28	40	32	24	36	10	17	36	30	8	19	
R3	29	23	37	26	20	33	5	14	32	25	4	17	
Mean	31^B	25.67^B	38.33^A	29^B	22^C	34.33^a	7^c	15.67^d	34^a	28^b	6^c	18.33^{cd}	
Within STZ				Within HZ									
Total Mean	31.000			Standard Deviation	5.240	Total Mean			20.667		Standard Deviation	10.676	
MSE	5.417			CD @ 5%	15.918	MSE			4.000		CD @ 5%	91.333	
R ²	0.857				R ²								0.976
Between STZ and HZ													
Total Mean		24.111				Standard Deviation			10.389				
MSE		85.980				CD @ 5%			9.935				
R ²		0.226											

Note: MSE- Mean Standard Error, CD at 5%-Critical Difference at 5%, Means with same letter did not show any significant variation

On the other hand low Mean yield of less than 10 fruits per meter of live fence was observed in STJCA10 and STJCA6. The soil samples of the areas belonging to these two accessions showed low Organic carbon and Nitrogen availability. The study conducted by (Omar *et al.*, 2014) found that the highest fruit production was observed at optimum Nitrogen application. While in Nitrogen control the fruit yield was low. This point out *J. curcas*' high demand for nitrogen for seed/fruit production. According to (Mengel and Kirkby 1987) and (Akbarian *et al.*, 2010) the Nitrogen deficiency might also impose a low demand of plants for other major nutrients like K, P, and secondary nutrients like Ca, S and Mg as the nitrogen deficient organs may not provide high sink strength.

With Annual rainfall ranging from 773.81 mm to 807.7 mm in 2017 Southern Transition Zone recorded Mean number of fruits per meter of live fence 31.00 ± 5.240 respectively. On the other side with annual rainfall ranging from 1075.18 mm to 2619.24 mm in 2017 Hilly Zone registered Mean number of fruits per meter of live fence 20.667 ± 10.676 respectively. Compared to accessions of HZ, STZ accessions showed better fruit yield with less Annual Rainfall (Table 1). This indicates *Jatropha curcas* being drought resistant crop could do better in general in semi arid regions compared to wet climate.

Conclusion

The fruit density per meter of live fence was found to be varying from low to high in the Hilly Zone. The low yield might be mainly because of inadequate soil nutrient. With respect to Fruit yield accessions of STZ with less Annual rainfall fared better than the Hilly Zone accessions. This indicates *Jatropha curcas* being drought resistant crop could do better in general in semi arid regions compared to wet climate.

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