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Influence of spacing and fertilizer levels on biomass production of *Salacia chinensis* Linn.

Salacia chinensis Linn. is an important medicinal plant belonging to the family Hippocrateaceae. It is a small, erect or straggling tree or large, woody, climbing shrub found almost throughout India including Andaman and Nicobar Islands. It is also distributed in the Western Ghats of Kerala, Karnataka, Maharashtra, Tamil Nadu and Goa and rarely seen in Eastern Ghats of Andhra Pradesh. It flowers during December and fruits during May. It grows in moist deciduous and evergreen forest at an altitude of 700-1500 m. The plant and its extracts have been evaluated for number of activities like anti-inflammatory, cardio-tonic, sedative, neuron-muscular thermogenic, urinary and astringent (Collene *et al.,* 2005). The demand for this plant is being sourced from wild populations. Hence, this study was initiated to assess the impact of fertilizer levels and spacing on early growth of *S. chinensis.*

A field experiment was conducted at the Agricultural Research Station, Malagi of Mundgod, Uttara Kannada district of Karnataka. The place is situated at 14°38' N latitude and 75°00' E longitude at an altitude of 490 m above mean sea level. The soil of the experimental site was sandy clay loam soil (KanHaplustalf). The soil was medium deep with fairly good drainage and average annual rainfall in the experimental area was 2175.5 mm. Major portion of the rainfall in the year was received from June to October. The mean annual temperature varied from 18 to 33°C. The April and May months were hottest while December and January were coldest.

The experiment was laid out in split plot design with the spacing 0.5 x 0.5, 0.5 x 1 and 1 x 1 m in main plot and fertilizer levels (Control, FYM – 10 tons/ha, 50:50:50 NPK/ha, FYM – 10 tons/ha + VAM- 5 g/plant, FYM – 10 tons/ha+50:50:50 NPK/ha, FYM – 10 tons/ha +50:100:50 NPK/ha) in subplot. Planting was taken up with one year old *S. chinensis* seedlings, which were procured from the College of Forestry, Sirsi, Karnataka. Fertilizer application was done after one month of planting. The plants were irrigated once in 20 days intervals. The weeding was carried out as and when required. Plant height, collar diameter and number of leaves were recorded at 2, 4, 6, 8 and 10 month after planting.

Significantly higher plant height, collar diameter and number of leaves were recorded in 1 x 1 m spacing (33.26 cm, 6.52 mm and 19.8) followed by 1 x 0.5 m spacing (32.37 cm, 6.47 mm and 19.6) and these two treatments were significantly superior over 0.5 x 0.5 m spacing (30.53 cm, 6.41 mm and 19.2) (Table 1). The reason might be that wider spacing results in the reduction of competition between the plants for nutrient and water. Wider spacing will help to supply nutrients to plant growth and development. The reduction in plant density will increases the availability of space for which plant will compete for sunlight, nutrient and soil moisture which boost the plant growth.

Application of 10 tons of FYM + 50:100:50 NPK kg/ha recorded maximum plant height, collar and number of leaves (42.15 cm, 7.18 mm and 19.8) it was significantly superior over other treatments. Application of 10 tons of FYM + 50:50:50 NPK kg/ha recorded 37.43 cm, 6.82 mm and 19.4 of plant height, collar diameter and number of leaves, respectively. The minimum plant height, collar diameter and number of leaves were recorded in control (23.68 cm, 5.84 mm and 18.0) (Table 1). The increased plant height, collar diameter and number of leaves might be due to application of optimum quantity of N, P_2O_5, K_2O fertilizers, further nitrogen application might have influenced chlorophyll formation in the plants, which lead to improve the photosynthetic activity and resulted in vigorous vegetative growth and development of plant. These findings are in line with studies conducted in *Acacia auriculiformis* A. Cunn. ex Benth (Lamani *et al.,* 2004), *Prosopis cineraria* Prosopis cineraria (L.) Druce (Jitendra *et al.,* 2010), *Terminalia arjuna* (L.) (Singh, 2011), *Populus deltoides* W. Bartram ex Marsh. (Baljitsingh, 2001).

The interaction between spacing and nutrient levels recorded significant difference in plant height, collar diameter and number of leaves among treatments. Wider spacing (1 x 1 m) along with 10 tons of FYM + 50:100:50 NPK kg/ha recorded significantly maximum height over other treatments (43.28 cm, 7.27mm and 20.2) followed by 1 x 0.5 m with 10 tons of FYM + 50:50:50 NPK kg/ha (42.08 cm, 7.16 mm and 20.0). Significantly lower plant height, collar diameter and number of leaves were recorded in (0.5 x 0.5 m with control), i.e. closer spacing without any fertilizer application. The interaction effect has influenced the plant height rather than individual treatment effect. The main factor influence might be due to the combination of spacing and nutrient management. These findings are in line with findings of Baljitsingh, 2001 in *P. deltoids.*

Department of Silviculture and Agroforestry
College of Agroforestry, Sirsi -581 401
Email: somapalyagar@gmail.com

J. SOMASHEKAR
K. S. CHANNABASAPPA

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Table 1. Effect of spacing and fertilizer levels on plant height, number of leaves and collar diameter of *Salacia chinensis* at different intervals

Treatments	Plant height (cm)					Number of leaves					Collar diameter (mm)				
	2 MAT	4 MAT	6 MAT	8 MAT	10 MAT	2 MAT	4 MAT	6 MAT	8 MAT	10 MAT	2 MAT	4 MAT	6 MAT	8 MAT	10 MAT
Spacing (S)															
S_1- 1 m × 1 m	15.09	19.47	23.85	28.83	33.26	7.2	9.6	12.8	15.2	19.8	1.58	2.56	3.80	5.13	6.52
S_2-1 m × 0.5 m	14.08	18.47	22.87	27.38	32.37	7.4	9.2	12.6	14.8	19.6	1.54	2.51	3.76	5.10	6.47
S_3- 0.5 m × 0.5 m	13.07	17.45	21.66	26.21	30.53	7.8	9.0	12.2	14.6	19.2	1.51	2.46	3.71	5.05	6.41
S.Em.±	0.03	0.03	0.05	0.03	0.04	0.01	0.01	0.01	0.03	0.01	0.007	0.003	0.003	0.001	0.003
C.D. at 5%	0.10	0.14	0.20	0.13	0.15	0.03	0.03	0.03	0.10	0.03	0.028	0.011	0.013	0.003	0.011
Fertilizer levels (F)															
F_1- Control	12.17	16.55	18.60	21.54	23.68	7.4	9.4	11.8	14.6	18.0	1.21	2.12	3.43	4.73	5.84
F_2- FYM-10 tons/ha	13.06	17.44	20.74	23.85	27.83	7.8	10.0	12.2	15.2	18.4	1.32	2.28	3.54	4.85	6.13
F_3- 50:50:50 NPK, kg/ha	13.70	18.09	21.90	25.83	29.45	8.0	10.2	12.6	15.4	18.8	1.46	2.43	3.67	4.93	6.35
F_4-FYM-10 tons/ha + VAM-5g/plant	14.16	18.53	22.90	27.79	31.77	8.2	10.6	12.8	15.6	19.2	1.55	2.54	3.80	5.20	6.48
F_5- FYM-10 tons/ha + 50:50:50 NPK, kg/ha	15.30	19.71	25.25	30.82	37.43	8.4	11.0	13.0	16.0	19.4	1.76	2.72	3.94	5.34	6.82
F_6-FYM-10 tons/ha + 50:100:50 NPK, kg/ha	16.08	20.46	27.39	34.99	42.15	8.8	11.4	13.2	16.4	19.8	1.97	2.94	4.16	5.49	7.18
S.Em.±	0.03	0.03	0.05	0.06	0.06	0.01	0.01	0.01	0.05	0.01	0.009	0.006	0.005	0.001	0.007
C.D. at 5%	0.09	0.08	0.17	0.18	0.18	0.03	0.03	0.03	0.13	0.03	0.026	0.016	0.013	0.003	0.019
Interactions (S x F)															
$S_1 \times F_1$	13.06	17.44	19.55	23.96	26.09	7.4	9.6	12.0	14.8	18.2	1.24	2.21	3.47	4.78	5.89
$S_1 \times F_2$	14.02	18.42	21.71	24.83	29.15	7.8	10.2	12.6	15.4	18.8	1.35	2.32	3.58	4.88	6.16
$S_1 \times F_3$	14.70	19.09	22.90	26.85	30.69	8.0	10.4	12.8	15.6	19.0	1.49	2.46	3.72	4.97	6.39
$S_1 \times F_4$	15.20	19.59	23.96	29.17	32.92	8.2	10.6	13.0	15.8	19.2	1.58	2.58	3.84	5.24	6.52
$S_1 \times F_5$	16.34	20.72	26.25	31.82	39.42	8.4	11.0	13.4	16.2	19.4	1.78	2.79	3.98	5.37	6.90
$S_1 \times F_6$	17.20	21.59	28.74	36.34	43.28	9.0	11.4	13.8	16.6	20.2	2.04	2.98	4.23	5.55	7.27
$S_2 \times F_1$	12.24	16.62	18.55	20.85	22.99	6.8	9.2	11.6	14.4	17.8	1.20	2.10	3.34	4.73	5.83
$S_2 \times F_2$	13.09	17.46	20.75	23.87	28.19	7.2	9.6	12.0	14.8	18.2	1.31	2.29	3.54	4.86	6.13
$S_2 \times F_3$	13.77	18.15	21.96	25.98	29.83	7.4	9.8	12.2	15.2	18.4	1.46	2.43	3.68	4.95	6.35
$S_2 \times F_4$	14.11	18.49	22.86	27.94	31.69	7.6	10.0	12.4	15.4	18.8	1.55	2.54	3.80	5.20	6.48
$S_2 \times F_5$	15.35	19.73	25.26	30.83	37.42	8.0	10.4	12.8	15.8	19.6	1.75	2.74	3.95	5.34	6.85
$S_2 \times F_6$	16.03	20.38	27.87	34.81	42.08	8.6	10.8	13.2	16.0	20.0	1.98	2.94	4.17	5.49	7.16
$S_3 \times F_1$	11.21	15.59	17.70	19.83	21.96	6.0	8.4	11.0	13.8	17.6	1.19	2.06	3.40	4.69	5.79
$S_3 \times F_2$	12.09	16.43	19.05	22.84	26.16	6.4	8.8	11.4	14.2	18.0	1.29	2.24	3.51	4.82	6.09
$S_3 \times F_3$	12.61	17.04	20.85	24.66	27.83	6.6	9.0	11.6	14.6	18.4	1.43	2.40	3.62	4.91	6.30
$S_3 \times F_4$	13.12	17.50	21.87	26.28	30.70	6.8	9.2	11.8	14.8	18.8	1.52	2.50	3.75	5.17	6.43
$S_3 \times F_5$	14.39	18.71	24.24	29.81	35.42	7.2	9.6	12.4	15.0	19.4	1.76	2.65	3.90	5.30	6.73
$S_3 \times F_6$	15.08	19.40	25.55	33.82	41.09	7.6	10.0	12.8	15.6	19.8	1.89	2.90	4.09	5.43	7.11
S.Em.±	0.04	0.05	0.09	0.12	0.10	0.02	0.02	0.02	0.08	0.02	0.016	0.010	0.008	0.002	0.011
C.D. at 5%	0.12	0.14	0.27	0.34	0.31	0.06	0.05	0.05	0.18	0.06	0.045	0.028	0.023	0.005	0.033

MAT – Month after treatment

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