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Effect of different levels of spacing, training and pruning on physiological and biochemical parameters of Thuthuvalai (*Solanum trilobatum* L.)

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ABSTRACT

Thuthuvalai (*Solanum trilobatum* L.) is an important medicinal plant in Indian system of medicines. The leaves and fruits are having several alkaloids. These alkaloids have been identified and used in large scale by pharmaceutical industries for formulating new drugs against many diseases and illness of human beings. In order to exploit this medicinal herb for commercial cultivation, the present investigation was carried out to study the effect of different levels of spacing, training and pruning on physiological and biochemical parameters of Thuthuvalai (*Solanum trilobatum* L.). The treatment consisted of three levels each of spacing 60 × 30 cm, 60 × 60 cm and 60 × 90 cm and training and pruning control (without training and pruning), Training alone (Without pruning) 30 cm height pruning with training 60 cm height pruning with training 90 cm height pruning with training. The spacing 60 × 90 cm, 60 cm height training and pruning and its interactions influenced significantly on total chlorophyll content, photosynthetic rate, proline content and total soluble protein and nitrate reductase activity and alkaloid content. The maximum physiological and biochemical parameters were registered at 60 × 60cm along with 60cm height of training and pruning and its interactions.

Keywords: Thuthuvalai (*Solanum trilobatum* L.), physiological, biochemical parameters

Introduction

The cultivation of medicinal and herbal plants has assumed greater importance in recent days due to the tremendous potential they offer in formulating new drugs against many diseases and illness. Among the various medicinal and herbal plants, the green medicinal herb, Thuthuvalai (*Solanum trilobatum* L.) is one such green remedy in ISM and Homeopathy. Thuthuvalai (*Solanum trilobatum* L.), belonging to the family Solanaceae, is a branched climbing shrub with sharp and curved prickles. This medicinal plant is commonly found in the regions of South and North West India. It is a well-known medicinal plant, used for curing all kinds of lung disorders. The fruits of this medicinal plant are also used as vegetable. The steroidal alkaloid, solasodine is present in the fruits of Thuthuvalai (Barnabas *et al.*, 1989). All parts of this plant are used against asthma, chronic febrile affections and difficult parturition. In the Sidha system of medicine, paste prepared from this plant is used to cure tuberculosis (Raman and Jaiwal, 2000). It is mostly found growing naturally in forests. It is not always possible to sustain regular supplies for an established industry from natural sources due to difficulties offered to uncertain collections from hilly terrain where they usually occur naturally. The medicinal properties and over exploitation necessitate, extensive cultivation of this crop. Though it is popularly grown in home garden as medicinal herb, until now there is no information on crop management. So far, no systematic work has been made to standardize spacing and training and pruning for Thuthuvalai. Hence, the present investigation was undertaken to find out the optimum spacing for better fruit yield and alkaloid content and to

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Find out the suitable training and pruning methods to increase fruit yield and alkaloid content.

Materials and Methods

The experiment was carried out at the Botanical Garden, Department of Medicinal and Aromatic Crops, Horticultural College and Research Institute, TNAU, Coimbatore. The seeds were sown in nursery beds. Forty five days old seedlings were transplanted in main field in a factorial randomized block design (FRBD) with three replications. The treatment consisted of three levels each of spacing 60 × 30 cm, 60 × 60 cm and 60 × 90 cm and

training and pruning control (without training and pruning), Training alone (Without pruning) 30 cm height pruning with training 60 cm height pruning with training 90 cm height pruning with training. The observations were recorded on chlorophyll content, photosynthetic rate, proline content and total soluble protein and nitrate reductase activity and alkaloid content. The results revealed that the maximum physiological and biochemical parameters were registered at 60 × 60cm along with 60cm height of training and pruning and its interactions.

The data generated through this investigation was analyzed by the statistical method of Panse and Sukhatme (1961) [7]

Table 1: Effect of different levels spacing, training and pruning on physiological and biochemical parameters in Thuthuvalai (*Solanum trilobatum* L.)

Treatment	total chlorophyll content (mg g ⁻¹)				nitrate reductase activity (µg NO ₂ hr ⁻¹ g ⁻¹)				total soluble protein (mg g ⁻¹)			
	S ₁	S ₂	S ₃	Mean	S ₁	S ₂	S ₃	Mean	S ₁	S ₂	S ₃	Mean
TP ₁	2.11	2.23	2.35	2.23	29.94	31.46	32.06	31.15	333.86	358.12	382.45	358.14
TP ₂	2.39	2.51	2.64	2.51	32.21	32.73	33.42	32.79	382.96	407.23	432.21	407.47
TP ₃	2.54	2.66	2.79	2.66	32.81	33.61	34.13	33.52	407.82	439.72	464.86	437.47
TP ₄	2.93	3.09	3.24	3.09	34.82	35.49	35.99	35.43	489.75	515.62	543.93	516.43
TP ₅	2.80	2.95	3.13	2.96	34.33	34.95	35.52	34.93	464.31	490.28	519.08	491.22
Mean	2.55	2.69	2.83	2.69	32.82	33.65	34.22	33.56	415.74	442.19	468.51	442.15
Source	SEd			CD (P = 0.05)	SEd			CD (P = 0.05)	SEd			CD (P = 0.05)
S	0.03			0.06	0.33			0.68	4.44			9.10
TP	0.04			0.07	0.43			0.88	5.73			11.74
S × TP	0.06			NS	0.75			NS	9.93			NS

Table 2: Effect of different levels spacing, training and pruning on physiological and biochemical parameters in Thuthuvalai (*Solanum trilobatum* L.)

Treatment	proline content (µg g ⁻¹)				photosynthetic rate (µmol/m ² /g)				Alkaloid content of leaf and fruit (%)			
	S ₁	S ₂	S ₃	Mean	S ₁	S ₂	S ₃	Mean	S ₁	S ₂	S ₃	Mean
TP ₁	74.08	75.52	76.93	75.51	58.02	60.43	62.97	60.47	1.380	1.410	1.440	1.410
TP ₂	77.18	78.43	80.04	78.55	63.23	67.06	69.72	66.67	1.450	1.480	1.520	1.483
TP ₃	78.96	80.63	81.92	80.50	67.39	70.02	72.64	70.02	1.490	1.530	1.570	1.530
TP ₄	83.42	85.20	87.19	85.27	76.24	79.92	82.46	79.54	1.620	1.670	1.720	1.670
TP ₅	82.13	83.94	85.86	83.98	73.81	77.56	79.99	77.12	1.580	1.630	1.680	1.630
Mean	79.15	80.74	82.39	80.76	67.74	71.00	73.56	70.76	1.504	1.544	1.586	1.545
Source	SEd			CD (P = 0.05)	SEd			CD (P = 0.05)	SEd			CD (P = 0.05)
S	0.81			1.65	0.71			1.45	0.015			0.032
TP	1.04			2.13	0.91			1.87	0.020			0.041
S × TP	1.80			NS	1.58			NS	0.034			0.071

Results and Discussion

The result indicated that plants grown at wider spacing had accumulated higher content of alkaloid in the leaf and fruit. It could be evident from the present investigations, the plants grown at wider spacing had well established growth and yield parameters. The physiological activity of these plants was also higher, which was measured in terms of total chlorophyll content, photosynthetic rate, proline content and total soluble protein and nitrate reductase activity. Since these plants had higher chlorophyll content the photosynthetic rate was also higher and it resulted in the accumulation of higher amounts of proline and total soluble protein. The higher activity of nitrate reductase also confirms that the plants had better physiological activity in terms of photosynthetic rate, since the higher nitrate reductase activity might have supplied nitrite form of nitrogen. This is in confirmation with the reports of Bhama (1991) and subbireddy and Krishnan (1991) [10] in *Solanum viarum*, Singh and Syamal (1995) [9] in brinjal and Siddappa *et al* (2010) [8] in curry leaf.

The training and pruning levels also exhibited considerable

Significant influence on alkaloid content of leaf and fruit. The alkaloid content in the leaf and fruit was found to be higher in plants pruned at either 60 cm or 90 cm height. The higher alkaloid content in these two treatments is attributable to the improved physiological activities. The plants in these treatments also had higher chlorophyll content which might have facilitated a higher rate of photosynthesis, which in turn might have promoted the production of precursors for secondary metabolites like alkaloids. Arthur and Lambeth (1994) [4] in tomato, Anon. (1999) [3] in *Gymnema sylvestre* Ali *et al.*, (1999) [3] in pepper mint, Elia *et al.*, (1994) in fennel and basi, Law *et al* (2009) [6] in tomato and Aminifoard *et al* (2012) in sweet pepper.

Summary

The study inferred that the spacing, 60 × 90 cm recorded maximum chlorophyll content, nitrate reductase activity, photosynthetic rate, proline content, total soluble protein and total alkaloid content in the leaf were registered in 60 × 90 cm spacing and 60 cm height training and pruning.

References

1. Ali SM, Yazdani D, Badi HN, Ahwazi M, Nazari F. Effect of N and P fertilizer levels and harvesting schedule on dry matter and oil yields in peppermint (*Mentha piperita*). J. Medicinal and Aromatic Pl. Sci. 1999; 21(4):927-930.
2. Aminifard MH, Aroiee H, Ameri A, Fatem H. Effect of plant density and nitrogen fertilizers on growth, yield and fruit quality of sweet pepper. African J. Agri.Res. 2012; 7(6):859-866.
3. Anon. Effect of pruning levels on growth and yield characters in *Gymnema sylvestre*, Res. Rep. Department of Floriculture and Landscaping, Horticultural College, Tamil Nadu Agricultural University, Coimbatore, 1999.
4. Arthur EG, Lambeth VN. Pruning and training tomatoes. Agricultural Publication G6460, University of Missari, Columbia, 1994.
5. Elia A, Damato G, Blaco VA. Topping time, yield and quality of florence fennel and basil. Acta Hort. 1994; 362:75-82.
6. Law KE, Eghaveuba RKA. Effect of planting density and NPK fertilizer application on yield and yield components of tomato in forest location. World J.Agril.Sci. 2009; 5(2):152-158.
7. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. ICAR, New Delhi, 1961..
8. Siddappa RN, Hedge K, Hanamashetti SI. Effect of planting density on growth performance during first year of establishment in curry leaf. J.Asian Horti. 2010; 6(2):57-59.
9. Singh VN, Syamal MM. Effect of nitrogen and spacing on yield and quality attributes on brinjal (*Solanum melongena* L.). J. Res. Bisra Agric. Univ. 1995; 7(2):137-139.
10. Subbireddy G, Krishnan R. Growth behaviour of diploids and induced autotetraploids of *Solanum viarum* under different spacings. Indian J. Agric. Sci. 1991; 61:264-267.