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Integrated nutrient management on growth and yield of Thuduvalai (*Solanum trilobatum* L.)

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Abstract
A field experiment was conducted at Annamalai University on Integrated nutrient management on growth and yield of thuduvalai. Randomized Block Design with three replication was adopted in thuduvalai and the inorganic sources viz., nitrogen, phosphorous and potassium. The organic sources i.e. Farmyard manure, vermicompost, coirpith compost and neem cake, Panchagavya and biofertilizers. The results showed application of 50% NPK (50:30:20 kg ha^{-1}) + VC (2.5 t ha^{-1}) + BF @ 2 kg ha^{-1} + PG @ 3% foliar spray to Thuduvalai had significant effect on growth and yield.

Keywords: Nutrient, fym, vermicompost, panchagavya and thuduvalai

Introduction
Thuduvalai (*Solanum trilobatum* L.) belongs to the family Solanaceae. In this crop have a thorny creeper with bluish violet flower, mostly grown in tropical areas which commonly available in southern India and it has been used traditional in siddha system of medicine. The leaves contain rich amount of calcium, iron, phosphorous, carbohydrates, protein, fat, crude fiber and minerals. This herb recently gaining importance in pharmaceutical industry due to its amazing drug potential. This plant is recommended for use as cardiac, tonic, carminative, asthma, cough, anti-ulcerogenic activity, antibacterial, antibiotic, anticancer activity and hepatoprotective activity. The active principle in this herb is solasodine, diosogenin, sobatum, solaine and tomatidine. This therapeutic value indicates the herb as one of the commercially viable and valuable plant in future for exploitation.

Materials and methodology
Field experiments were conducted at Faculty of Horticulture, Annamalai University, Annamalai Nagar, Chidambaram. The experiments were laid out in a randomized block design with thirteen treatments replicated thrice. The data were subjected to statistical analysis as suggested by The treatment schedule was as follows.

Result and Discussion
Significant variation on the plant height was observed due to various treatments. Among the treatment the maximum plant height was recorded (69.12, 122.5 and 166.42 cm at 90, 120 and 150 DAT) in T_6 (50% NPK (50:30:20 kg ha^{-1}) + Vermicompost (2.5 t ha^{-1}) + Biofertilizers (*Azospirillum* and Phosphobacteria each @ 2 kg ha^{-1})] + Panchagavya @ 3% foliar spray at 60, 90 and 120 DAT. The increase in growth parameters due to application of vermicompost may be due to the presence of growth substances, nitrogen fixers, other essential nutrients and also due to higher phosphorus by a symbiotic mycorrhizal association as reported by (Bano *et al.*, 1987) [1]. Incorporation of vermicompost promotes the lush growth of plants which may be due to the presence of plant growth promoters like auxins and cytokinins in vermicompost (Radha *et al.*, 1986) [4], which are responsible for cell division and cell elongation.
Among the various treatment the maximum number of branches was registered in T_6 (8.56, 18.03 and 35.97 at 90, 120 and 150 DAT) and it was followed by T_3 which recorded the value of 8.18, 17.31 and 34.23 at 90, 120 and 150 DAT respectively. The least number of branches was recorded in T_{13} (control) 4.79, 11.06 and 18.19 at 90, 120 and 150 DAT respectively. The increase in growth parameters due to application of Vermicompost may be due to the presence of growth substance, nitrogen fixers other essential nutrient and also due to higher phosphorous fertilization by a symbiotic mycorrhizal association as observed by Chaudhary

et al., (2004) [2] application of *Azospirillum* and Phosphobacteria contains biological active substance such as plant growth regulators which enhanced sufficient quantity of nutrient flow in the plant system, thereby stimulating the auxiliary bud and leading to increase in plant height and number of branches as reported by Sharmila *et al*. (2005) [6] in ashwagandha.

The data pertaining to the various treatments on leaf area is presented in Table 4. Significant variation on the leaf area was observed due to the influence of various treatment. Among the treatments, the highest leaf area (26.53, 29.13 and 35.23 cm^2 at 90, 120 and 150 DAT) was recorded in T_6 and it was followed by T_3 which registered the leaf area of 25.47, 28.06 and 34.02 cm^2 at 90, 120 and 150 DAT respectively. The least leaf area of (15.83, 18.34 and 22.49 at 90, 120 and 150 DAT) recorded in T_{13} (control). The reasons for highest leaf area was due to enhanced release of nitrogen from the growth promoting substances produced by the microbes present in vermicompost might have resulted in the induction of leaf area. Foliar application of panchagavya enhanced the production of leaf area. The results were in conformity with the experiment conducted by Manivannan and Kudiyarasi (2010) [3] in gymnema.

It can be inferred from the data tabulated in table (2) that there were significant differences among the various treatment with regard to leaf yield g per plant, leaf yield g per plot and leaf yield g per hectare. The leaf yield was maximum (209.63 g $plant^{-1}$, 1.88 kg $plot^{-1}$ and 10.35 t ha^{-1}) in the treatment (T_6). This may be attributed to fact that under increasing fertility levels by the application of inorganic fertilizers there would be luxuriant growth of the plant, which lead to production of more number of branches, leaves and ultimately resulting in higher leaf yield ha^{-1}. The results are similar to the findings of Sendhinathan and Karuppaiah (2008) [5] in periwinkle.

Treatment Details	
T_1	100% NPK (100:60:40 kg ha^{-1}) + FYM (25 t ha^{-1})
T_2	75% NPK (75:45:30 kg ha^{-1}) + FYM (25 t ha^{-1}) + Biofertilizers (*Azospirillum* andPhosphobacteria each @ 2 kg ha^{-1})
T_3	50% NPK (50:30:20 kg ha^{-1}) + FYM (25 t ha^{-1}) + Biofertilizers (*Azospirillum* and Phosphobacteria each @ 2 kg ha^{-1}) + Panchagavya@ 3 per cent foliar spray at 60, 90 and 120 DAT
T_4	100% NPK (100:60:40 kg ha^{-1}) + Vermicompost (2.5 t ha^{-1})
T_5	75%NPK (75:45:30 kg ha^{-1}) + Vermicompost (2.5 t ha^{-1}) + Biofertilizers (*Azospirillum* and Phosphobacteria each @ 2 kg ha^{-1})
T_6	50% NPK (50:30:20 kg ha^{-1}) + Vermicompost (2.5 t ha^{-1}) + Biofertilizers (*Azospirillum* and Phosphobacteria each @ 2 kg ha^{-1}) + Panchagavya @ 3 per cent at foliar spray 60, 90 and 120 DAT
T_7	100% NPK (100:60:40 kg ha^{-1}) + Coirpith compost (5 t ha^{-1})
T_8	75% NPK (75:45:30 kg ha^{-1}) + Coirpith compost (5 t ha^{-1}) + Biofertilizers (*Azospirillum* and Phosphobacteria each @ 2 kg ha^{-1})
T_9	50% NPK (50:30:20 kg ha^{-1}) + Coirpith compost (5 t ha^{-1}) + Biofertilizers (*Azospirillum* and Phosphobacteria each @ 2 kg ha^{-1}) + Panchagavya @ 3 per cent foliar spray at 60, 90 and 120 DAT
T_{10}	100% NPK (100:60:40 kg ha^{-1}) + Neem Cake (2.5 t ha^{-1})
T_{11}	75% NPK (75:45:30 kg ha^{-1}) + Neem Cake (2.5 t ha^{-1}) + Biofertilizers (*Azospirillum* and Phosphobacteria each @ 2 kg ha^{-1})
T_{12}	50% NPK (50:30:20 kg ha^{-1}) + Neem Cake (2.5 t ha^{-1}) + Biofertilizers (*Azospirillum* and Phosphobacteria each @ 2 kg ha^{-1}) + Panchagavya @ 3 per cent foliar spray at 60, 90 and 120 DAT
T_{13}	Control

Table 1: Effect of integrated nutrient management on plant height (cm) and number of secondary branches in Thuduvalai (*Solanum trilobatum* L.)

Treatments	Plant Height (cm)			Number of Secondary Branches per Plant		
	90 DAT	120 DAT	150 DAT	90 DAT	120 DAT	150 DAT
T_1 -100% NPK (100:60:40 kg ha^{-1})+FYM (25 t ha^{-1})	61.60	111.43	150.77	7.67	16.47	32.24
T_2 - 75% NPK (75:45:30 kg ha^{-1}) + FYM (25 t ha^{-1}) +BF @ 2 kg ha^{-1}	43.30	84.75	113.10	5.51	12.41	21.69
T_3 - 50% NPK (50:30:20 kg ha^{-1})+ FYM (25 t ha^{-1}+ BF @ 2 kg ha^{-1} + PG @ 3% foliar spray	66.25	117.96	159.87	8.18	17.31	34.23
T_4 - 100% NPK (100:60:40 kg ha^{-1}) +VC (2.5 t ha^{-1})	58.71	106.90	144.23	7.34	15.71	30.04
T_5 - 75% NPK (75:45:30 kg ha^{-1}) + VC (2.5 t ha^{-1}) + BF @ 2 kg ha^{-1}	51.03	95.85	128.75	6.46	14.05	25.85
T_6 - 50% NPK (50:30:20 kg ha^{-1}) + VC (2.5 t ha^{-1}) + BF @ 2 kg ha^{-1} + PG @ 3% foliar spray	69.12	122.50	166.42	8.56	18.03	35.97
T_7 - 100% NPK (100:60:40 kg ha^{-1}) + CP (5 t ha^{-1})	48.18	91.35	122.18	6.09	13.34	24.06
T_8 - 75% NPK (75:45:30 kg ha^{-1}) + CP (5 t ha^{-1}) + BF @ 2 kg ha^{-1}	40.37	80.24	106.48	5.14	11.74	19.92
T_9 - 50% NPK (50:30:20 kg ha^{-1}) + CP (5 t ha^{-1}) + BF @ 2 kg ha^{-1} + PG @ 3% foliar spray	53.86	100.46	135.34	6.80	14.77	27.62
T_{10} - 100% NPK (100:60:40 kg ha^{-1}) + NC (2.5 t ha^{-1})	64.29	116.00	157.36	8.04	17.10	33.56
T_{11} - 75% NPK (75:45:30 kg ha^{-1}) + NC (2.5 t ha^{-1}) + BF @ 2 kg ha^{-1}	46.25	89.38	119.17	5.90	13.11	23.43
T_{12} - 50% NPK (50:30:20 kg ha^{-1}) + NC (2.5 t ha^{-1}) + BF @ 2 kg ha^{-1} + PG @ 3% foliar spray	55.80	102.31	137.70	6.97	15.04	28.31
T_{13} – Control	37.40	75.94	100.90	4.79	11.06	18.19

Table 2: Effect of integrated nutrient management on green leaf yield (g plant^{-1}), leaf yield (kg plot^{-1}) and estimated leaf yield (t ha^{-1}) in Thuduvalai (*Solanum trilobatum* L.)

Treatments	Leaf yield (g plant^{-1})	Leaf yield (kg plot^{-1})	Estimated Leaf yield (t ha^{-1})
T_1 - 100% NPK (100:60:40 kg ha^{-1}) + FYM (25 t ha^{-1})	181.97	1.64	8.98
T_2 - 75% NPK (75:45:30 kg ha^{-1}) + FYM (25 t ha^{-1}) +BF @ 2 kg ha^{-1}	114.84	1.03	5.67
T_3 - 50% NPK (50:30:20 kg ha^{-1}) + FYM (25 t ha^{-1}) + BF @ 2 kg ha^{-1} + PG @ 3% foliar spray	198.67	1.78	9.63
T_4 - 100% NPK (100:60:40 kg ha^{-1}) + VC (2.5 t ha^{-1})	170.30	1.53	8.40
T_5 - 75% NPK (75:45:30 kg ha^{-1}) + VC (2.5 t ha^{-1}) + BF @ 2 kg ha^{-1}	141.42	1.27	6.98
T_6 - 50% NPK (50:30:20 kg ha^{-1}) + VC (2.5 t ha^{-1}) + BF @ 2 kg ha^{-1} + PG @ 3% foliar spray	209.63	1.88	10.35
T_7 - 100% NPK (100:60:40 kg ha^{-1}) + CP (5 t ha^{-1})	130.89	1.17	6.46
T_8 - 75% NPK (75:45:30 kg ha^{-1}) + CP (5 t ha^{-1}) + BF @ 2 kg ha^{-1}	104.35	0.93	5.15
T_9 - 50% NPK (50:30:20 kg ha^{-1}) + CP (5 t ha^{-1}) + BF @ 2 kg ha^{-1} + PG @ 3% foliar spray	153.39	1.38	7.57
T_{10} - 100% NPK (100:60:40 kg ha^{-1}) + NC (2.5 t ha^{-1})	193.31	1.73	9.54
T_{11} - 75% NPK (75:45:30 kg ha^{-1}) + NC (2.5 t ha^{-1}) + BF @ 2 kg ha^{-1}	125.47	1.12	6.19
T_{12} - 50% NPK (50:30:20 kg ha^{-1}) + NC (2.5 t ha^{-1}) + BF @ 2 kg ha^{-1} + PG @ 3% foliar spray	158.80	1.42	7.82
T_{13} - Control	61.02	0.54	3.01

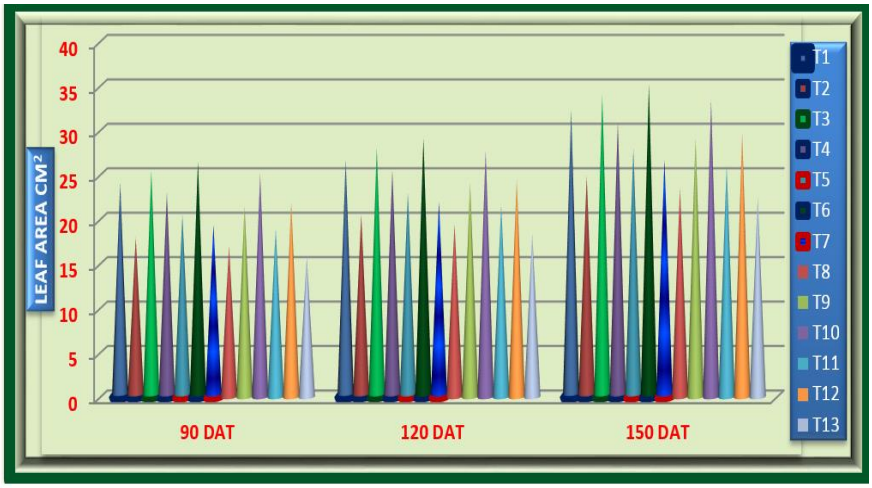

Fig 1: Effect of integrated nutrient management on leaf area (cm^2) in Thuduvalai (*Solanum trilobatum* L.)

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