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## Studies on the effect of different fertilizers doses on growth and yield of Acid lime (*Citrus aurantifolia Swingle*) under low cost gravity drip irrigation

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### Abstract

Studies on the effect of different fertilizers doses on growth and yield of Acid lime (*Citrus aurantifolia Swingle*) under low cost gravity drip irrigation was conducted at PFDC, Department of Fruit Science, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (CG), during the session 2020-21. The results revealed that the growth parameters of plants were significantly influenced by the organic and inorganic fertilizers. Results showed that the maximum plant height (2.97 m), stem girth (22.22 cm), tree canopy spread E-W (2.90 m) and N-S (2.87 m), number of branches (34), number of leaves (120), number of flowers (130), at harvest with the application of T9 (80% of RDF + vermiwash + cow urine through drip). While minimum growth parameters were recorded in T0 (100% of RDF as soil application and irrigation through drip system). Yield parameters of plant were significantly influenced by the organic and inorganic fertilizers. Results showed that the maximum number of fruit per tree (130), weight of fruit per plant (marketable, kg/tree) (9.45 kg/tree), fruit yield per tree (kg/tree) (10.95 kg/tree), fruit yield per hecture (t/ha.) (11.84 t/ha.), average fruit weight (75g) at harvest with the application of T9 (80% of RDF + vermiwash + cow urine through drip). While minimum yield parameters were recorded in T0 (100% of RDF as soil application and irrigation through drip system).

**Keywords:** Acidlime, fertilizers, parameters, RDF, treatments

### Introduction

Acid lime responds very well to nutrient management. Due to high cost of chemical fertilizers and increasing trend towards organic farming, use of organic fertilizers like FYM and vermicompost occupies a significant place in today's agriculture. Tisdale *et al.* (1982) Organic supplements such as vermiwash and vermicompost promote humification, increased microbial activity, and enzyme synthesis, which leads to increased aggregate stability of soil particles and improved aeration. According to Haynes (1986), Vermiwash has the ability to bind mineral particles such as calcium, magnesium, and potassium in the form of humus and clay colloids, allowing for stable aggregates of soil particles to maintain plant growth. Vermiwash contains 0.5 percent nitrogen, 0.39 percent phosphorus, and 0.46 percent potassium, as well as earthworm enzymes and secretions that can aid crop growth (Jasmine, 1999). Ismail (1995) <sup>[10]</sup> reported that vermiwash was extremely effective for foliar application in nurseries, lawns and orchids for obtaining maximum growth (Pillai *et al.* 2016). The nutrient substance of cow's urine was reported to be 0.8-1.3% N, 0.3 -0.4% P and 0.6-1% K (Bertram, 1999). Cow urine (Gomutra) includes a variety of nitrogen components in varying levels and can be utilised as a nitrogen source for plants. 95 percent of cow urine is water, 2.5 percent is urea, and the rest is nitrogen, sulphur, phosphate, sodium, manganese, carbolic acid, iron, silicon, chlorine, salt, vitamins, enzymes, hormones, and so on. It increases the microbial enzymal activities in soil, hence, it can be well thought-out as bio-fertilizer for increasing soil fertility.

### Materials and Methods

The experiment was conducted for years 2020-21 the Rabi season at PFDC, Department of Fruit Science, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (CG). As many, ninety trees were selected on the basis of uniform vigour and maintained under uniform cultural practice (drip irrigation in alternate day, weeding of orchard along with plant basin as when observed). The soil at experimental site was clay-loam in texture (vertisols), having good drainage capacity and whole study was undertaken according to Randomized Block Design (RBD) in three replications, comprised of 10 treatments.

The experimental site comes under sub-tropical conditions and located at 21°16' N latitude and 81°31' E longitude with an altitude of 298.56 meters above the mean sea level. Meteorological data on temperature, rainfall, relative humidity and sunshine hours was recorded during the cropping period at the Meteorological Observatory Unit, Department of Agro-meteorology, IGKV, Raipur. The weekly mean maximum temperature during the investigation varied between 30.43 °C to 35.73 °C in year 2020, weekly mean minimum temperature varied between 13.77 °C to 16.45 °C. The total rainfall received during the crop growth period was 14.4 mm, weekly mean relative humidity throughout the crop season varied between 36.75 per cent to 87.25 per cent. The weekly average values of open pan evaporation ranged from 23.02 mm/day, furthermore, average sunshine values varied 6.47 hrs/day, than, weekly mean maximum wind velocity during crop period. The experiment comprises of ten treatments consisting of one control and nine treatments of experimental field with a replicated three in a Randomized Block Design (RBD). The experiment comprises of ten treatments- (T<sub>0</sub>) 100% of RDF as soil application and irrigation through drip system, (T<sub>1</sub>) 60% of RDF through fertigation, (T<sub>2</sub>) 80% of RDF through fertigation, (T<sub>3</sub>) 100% of RDF through fertigation, (T<sub>4</sub>) 60% of RDF + vermiwash through drip (one liter per week), (T<sub>5</sub>) 80% of RDF + cowurine through drip (one liter per week), (T<sub>6</sub>) 60% of RDF + cowurine through drip (one liter per week), (T<sub>7</sub>) 80% of RDF + vermiwash through drip (one liter per week), (T<sub>8</sub>) 60% of RDF + vermiwash + cowurine through drip (one liter per week) and (T<sub>9</sub>) 80% of RDF + vermiwash + cowurine through drip (one liter per week). Observation on plant

growth and yield: The height and spread (E-W × N-S) of the trees was measured at end of the growing season in meters (m) with the help of graduated flag staff, Number of branches of tree were counted at harvesting periods by counting of particular branches of tree. The average number of branches was calculated, The number of leaves per shoot were counted during harvesting periods of fruits. The number of flowers per tree were counted at reproductive stage of plant in research farm. The average number of flowers per shoot was calculated and Fruit of each tree in particular treatment and replication were counted at each harvesting it was summed up and number of fruits per tree computed, The weight of ten observational fruit were recorded on the top pan balance. The vale are summed up and average fruit weight was computed by dividing total weight of fruits by total number of fruits, Weight of Fruit per plant (Marketable kg/tree) The fruit weight from plants, excluding stalk, leaves were weighed on electronic balance. The values were worked out and expressed in kilogram, Fruit yield per tree (kg/tree) was calculated by the following formula: Yield/plant (kg) = no. of fruit/plant x fruit weight(g) by dividing 1000, Acidlime which are two year old plants and plants continues under pruning two partial and two heavy pruning are done within two years. Spacing R<sub>x</sub>R and P<sub>x</sub>P is 3 meter, square systems of planting, details of treatments are given in table no.-1. The data generated from these investigations were appropriately computed, tabulated and analyzed as described by using MS-Excel and OPSTAT in Randomized Block Design. (RBD).

## Result

**Table 1:** Effect of different fertilizers doses on growth parameters

	Treatment Combinations	Plant height(m)	Stem girth (Cm)	Tree Canopy (m)		No. of branches	No. of leaves per shoot	No. of flowers per tree
				E-W	N-S			
T <sub>0</sub>	100% of RDF as soil application and through drip system	2.10	21.5	2.11	2.10	15	86	90
T <sub>1</sub>	60% of RDF through fertigation.	2.75	21.70	2.30	2.27	19	92	118
T <sub>2</sub>	80% of RDF Through fertigation.	2.82	21.78	2.70	2.65	27	105	138
T <sub>3</sub>	100% of RDF through fertigation.	2.85	21.80	2.73	2.70	28	107	145
T <sub>4</sub>	60% of RDF + vermiwash through drip (one liter per week).	2.77	21.71	2.33	2.27	20	97	120
T <sub>5</sub>	80% of RDF + cowurine through drip (one liter per week).	2.95	22.10	2.85	2.83	31	111	158
T <sub>6</sub>	60% of RDF + cowurine through drip (one liter per week).	2.78	21.73	2.55	2.51	23	100	122
T <sub>7</sub>	80% of RDF + vermiwash through drip (one liter per week).	2.91	21.95	2.81	2.79	29	110	149
T <sub>8</sub>	60% of RDF + vermiwash + cowurine through drip (one liter per week).	2.80	21.76	2.65	2.61	25	103	130
T <sub>9</sub>	80% of RDF + vermiwash + cowurine through drip (one liter per week).	2.97	22.22	2.90	2.87	34	120	168
	S.Em. ±	0.02	0.10	0.03	0.04	0.99	1.77	2.17
	C.D. at 5%	0.07	0.31	0.09	0.12	2.96	5.33	6.59

## Growth parameters

The growth parameters of plants were significantly influenced by the organic and inorganic fertilizers. Results showed that the maximum plant height (2.97 m), stem girth (22.22 cm), tree canopy spread E-W (2.90 m) and N-S (2.87 m), number of branches (34), number of leaves (120), number of flowers (130), at harvest with the application of T<sub>9</sub> (80% of RDF + vermiwash + cowurine through drip). While minimum growth parameters were recorded in T<sub>0</sub> (100% of RDF as soil

application and irrigation through drip system). The similar result was obtained by Trivedi *et al.* (2012) [23] and reported that, the beneficial effects of nitrogen in promoting growth parameters may be due to enhanced synthesis and accumulation of protein, amino acid and enzymes which are responsible for cell division and cell elongation hence growth of plant. Similar results were reported by Goramnagar *et al.* (2000) in Nagpur orange and Dudi *et al.* (2003) [9] in kinnow mandarin.

**Table 2:** Effect of different fertilizers doses on yield parameters

	Treatment Combinations	Number of fruit per tree	Average fruit weight (g)	Weight of Fruit per plant (Marketable. kg/tree)	Fruit yield per tree (kg/tree)	Fruit yield per Hacture (t/ha.)
T <sub>0</sub>	100% of RDF as soil application and through drip system	75	55	3.10	4.12	4.57
T <sub>1</sub>	60% of RDF through fertigation.	78	56	3.68	4.36	4.84
T <sub>2</sub>	80% of RDF Through fertigation.	99	65	6.11	6.48	7.14
T <sub>3</sub>	100% of RDF through fertigation.	103	68	7.04	7.20	7.77
T <sub>4</sub>	60% of RDF + vermiwash through drip (one liter per week).	80	57	4.12	4.56	5.06
T <sub>5</sub>	80% of RDF + cowurine through drip (one liter per week).	119	73	7.70	8.68	9.64
T <sub>6</sub>	60% of RDF + cowurine through drip (one liter per week).	85	60	4.80	5.10	5.66
T <sub>7</sub>	80% of RDF + vermiwash through drip (one liter per week).	115	70	7.64	8.05	8.94
T <sub>8</sub>	60% of RDF + vermiwash + cowurine through drip (one liter per week).	90	63	5.10	5.80	6.29
T <sub>9</sub>	80% of RDF + vermiwash + cowurine through drip (one liter per week).	130	75	9.20	9.75	10.83
	S.Em. ±	2.71	0.99	0.21	0.39	0.46
	C.D. at 5%	8.20	3.01	0.67	1.19	1.39

### Yield parameters

Results showed that the maximum number of fruit per tree (130), weight of fruit per plant (marketable, kg/tree) (9.20 kg/tree), fruit yield per tree (kg/tree) (9.75 kg/tree), fruit yield per hecture (t/ha.) (10.83 t/ha.), average fruit weight (75g) at harvest with the application of T<sub>9</sub> (80% of RDF + vermiwash + cowurine through drip). While minimum yield parameters were recorded in T<sub>0</sub> (100% of RDF as soil application and irrigation through drip system).

Our studies, hence, provided a database proof that Among the treatments the application of T<sub>9</sub> (80% of RDF + vermiwash + cowurine) is better then others treatments because Use of vermiwash, cowurine in combination with chemical fertilizers was more effective for more vegetative growth and yield in acidlime fruit.

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