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Effect of Media on Growth Parameters of Red Ginger (*Alpinia purpurata* (Vieill.) K. Schum.)

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A B S T R A C T

An experiment was conducted to study the effect of media on growth parameters of red ginger (*Alpinia purpurata* (Vieill.) K. Schum.) for perfect growing media mixture suitable for production of good quality plants at Swamithoppu village, Kanniyakumari District, Tamil Nadu during 2018-2020. The experiment was laid out in completely randomized design (CRD) with eleven treatment combinations of various growing media mixtures, comprising of red earth, river sand as basic components in combination with organic manures viz., FYM, coir pith, vermicompost and leaf mould compost. Control treatment was maintained with red earth and river sand. Red ginger plants were planted in polythene bags filled with respective planting media as per treatment schedule and biometric observations were recorded. The results revealed that the red ginger growth parameters were enhanced with the media sand + red earth + vermicompost + coirpith @ 1:1:1/2:1/2, v/v (T_8) which recorded maximum values in plant height (69.68 cm), number of leaves per plant (92.75), number of suckers per plant (22.66), leaf length (25.47), leaf width (7.42), leaf area (126.62 cm^2), plant spread north-south (78.51 cm), plant spread east-west (65.23 cm), fresh weight of shoot (76.14 g), fresh weight of root and rhizomes (45.71 g), dry weight of shoot (10.82 g), dry weight of root and rhizomes (6.51 g), total fresh biomass of the plant (121.81 g) and dry matter production of plant (17.19 g) at 240 days after planting. The next best results on these parameters were obtained with T_9- sand + red earth + vermicompost + leaf mould compost (1:1:1/2:1/2, v/v), while the minimum values for the above parameters were noticed with control.

***Key words*:** Alpinia, Red ginger, Sand, Red earth, Vermicompost, Coir pith, Leaf mould compost

Alpinia purpurata belongs to the family Zingiberaceae. It propagated by seeds and by rhizome division. It is listed as invasive in Cuba and on several Pacific islands including Hawaii, Fiji, Micronesia, Guam, Palau, and Tonga [1]. *Alpinia purpurata* is native to Malesia (Papua New Guinea) and the Southwestern Pacific (New Caledonia, Solomon Islands and Vanuatu). *Alpinia purpurata* is able to grow forming dense thickets and displacing native vegetation principally in moist habitats such as riverbanks, edges of wetlands and mangroves and the under story of moist secondary forests [2]. It has different cultivars like Anne hironake, Darwin series, Dwarf pink, Eileen McDonald, Fireball, Hot Pink, Jungle king, Jungle Queen, Kazu, Kimi (Kimie), Pink Princess, Polynesian Princess, Raspberry, Red Dwarf, Red ginger, Rosy Dawn, Tahitian, Tomi Pink [3]. Red ginger variety produce elongated inflorescence with dark red bracts and aerial off shoots abundantly. It grows 3-13 feet height. It shows great potential as a cut flower because of its year-round flower production and cut flower have outstanding post-harvest characteristics. It can be used as cut foliage [4]. It is also suitable for wild style or free style gardens. The plant can be cultivated as an intercrop in Arecanut, Coconut groves and rubber plantations etc. A best growing media should have proper aeration, water holding capacity and adequate nutrition supply. Different manures provide good nutrition to plants when applied in combination with soil less substrates. Growing media generally have three components i.e., mainly with water, dissolved nutrients (33-50%) with 12% oxygen. This type of combination is reported to be good for vigorous growth and stronger root system [5]. The use of synthetic fertilizers causes technological dependence, increases production costs, decreases soil organic matter and the capacity for water storage and alters soil structure and soil pH. Organic manures are an ecological alternative to increase fertility and crop production in sustainable agro-ecosystems. Their use improves the physical, chemical and biological characteristics of the soil even though they are lower in nutrients compared with inorganic fertilizers. The use of organic manures plays a key role for foliage growth and

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yield *A. purpurata*. In present study, coir pith, vermicompost, farmyard manure and leaf mould compost were used in different proportions. Coco peat, which improves porosity, water holding capacity, cation exchange capacity and buffers pH well in a very acceptable range for plant growth, where on the other hand, vermicompost rich in humus and contains valuable vitamins, enzymes and hormones like Auxins, Gibbrellins, etc. for better growth and development [6]. Farmyard manure and leaf mould compost also a promisable growing medias, which have all essential nutrients to the plant at easily available form. It improves soil texture and increases its moisture retention capacity. By, considering the above scientific facts, the present investigation effect of media on growth parameters of red ginger (*Alpinia purpurata* (Vieill.) K. Schum.) was carried out to study the influence of organic manures viz., FYM, vermicompost, coir pith and leaf mould compost as a component of growing media on growth and parameters of *Alpinia purpurata*.

MATERIALS AND METHODS

The present experiment entitled "Effect of media on growth parameters of red ginger (*Alpinia purpurata* (Vieill.) K. Schum.)" was carried out at Swamithoppu village, Kanniyakumari District, Tamil Nadu, during the year 2018-2020. The details of materials used and methods adopted during the course of investigation are described in this chapter. An experiment was laid out in completely randomized designs with three replications. The treatments were: T_1- sand + red earth + FYM (1:1:1, v/v), T_2- sand + red earth + vermicompost (1:1:1, v/v), T_3- sand + red earth + coirpith (1:1:1, v/v), T_4- sand + red earth + Leaf mould compost (1:1:1, v/v), T_5- sand + red earth + FYM + vermicompost (1:1:1/2:1/2, v/v), T_6- sand + red earth + FYM + coirpith (1:1:1/2:1/2, v/v), T_7- sand + red earth + FYM + leaf mould compost (1:1:1/2:1/2, v/v), T_8- sand + red earth + vermicompost + coirpith (1:1:1/2:1/2, v/v), T_9- sand + red earth + vermicompost + leaf mould compost (1:1:1/2:1/2, v/v), T_{10}- sand + red earth + coirpith + leaf mould compost (1:1:1/2:1/2, v/v), T_{11}- sand + red earth - control (1:1, v/v). Required amount of red earth, river sand, farmyard manure, vermicompost, coir pith and leaf mould compost were mixed based on treatment schedule. The potting mixture filled in 600-gauge thickness and 30 cm × 30 cm dimension polybags. Then one month old *Alpinia purpurata* with 4-5 leaves stage saplings were transplanted on 22 July 2019 at the rate of one sapling per polybag. Immediately after planting light irrigation was given for better establishment of plants. Plants were maintained in semi shade condition. Observations are recorded on various growth parameters like plant height (cm), number of leaves per plant, number of suckers per plant, leaf length (cm), leaf width (cm), leaf area (cm^2), plant spread (N-S) (E-W) (cm), fresh weight of shoot (g), fresh weight of roots and rhizomes (g), dry weight of shoot (g), dry weight of root and rhizomes (g), total fresh biomass of the plant (g) and dry matter production of plant (g) were analyzed statistically.

Table 1 Effect of media on growth parameters of red ginger (*Alpinia purpurata* (Vieill.) K. Schum.)

Treatments	240 days after planting													
	Plant height (cm)	No. of leaves/ plant	No. of suckers/ plant	leaf length (cm)	Leaf width (cm)	Leaf area (cm^2)	Plant spread (N-S) (cm)	Plant spread (E-W) (cm)	Fresh weight of shoot (g)	Fresh weight of root and rhizome (g)	Dry weight of shoot (g)	Dry weight of root and rhizome (g)	Total fresh biomass (g)	Dry matter production (g)
T_1	39.92	51.14	14.33	14.43	4.13	39.92	45.34	37.00	42.87	25.72	6.01	3.6	68.63	9.61
T_2	58.86	88.03	20.00	21.54	6.24	90.05	67.02	55.76	65.05	39.02	9.13	5.47	104.07	14.60
T_3	46.92	60.41	16.33	17.03	4.98	56.82	53.25	43.85	50.75	30.44	7.12	4.26	81.19	11.38
T_4	43.31	55.73	15.00	15.74	4.57	48.19	49.36	40.60	46.87	28.11	6.56	3.94	74.98	10.50
T_5	62.16	78.36	19.33	22.98	6.65	102.38	70.84	58.85	68.74	41.24	9.64	5.79	109.98	15.43
T_6	51.61	68.84	17.66	19.00	5.69	72.43	59.33	49.56	57.60	34.56	8.08	4.84	92.16	12.92
T_7	50.34	65.24	17.00	18.33	5.40	66.31	57.11	47.06	54.49	32.68	7.64	4.58	87.17	12.22
T_8	69.68	92.75	22.66	25.47	7.42	126.62	78.51	65.23	76.14	45.71	10.82	6.51	121.81	17.19
T_9	65.84	83.05	21.33	24.21	7.02	113.86	74.65	62.01	72.43	43.45	10.20	6.13	115.87	16.29
T_{10}	55.51	73.60	18.66	20.28	5.82	79.07	63.18	52.64	61.32	36.80	8.60	5.16	98.12	13.76
T_{11}	36.06	45.23	11.00	12.92	3.69	31.94	40.84	33.35	37.65	22.58	5.27	3.16	60.23	8.43
SED	1.60	2.10	0.53	0.58	0.17	2.32	1.81	1.50	1.75	1.05	0.25	0.15	2.81	0.39
CD (P=0.05)	3.32	4.35	1.10	1.21	0.35	4.80	3.77	3.11	3.63	2.18	0.51	0.30	5.81	0.81

RESULTS AND DISCUSSION

Growth parameters of red ginger

The response of different growing media treatments was influenced by various vegetative growth parameters of polybag grown red gingers at 240 days after planting were recorded. Among the different growing media mixtures, sand + red earth + vermicompost + coirpith @ 1:1:1/2:1/2, v/v (T_8) was considered to have greater influence on the growth parameters of the *Alpinia pupurata* plants viz., plant height (69.68 cm), number of leaves per plant (92.75), number of suckers per plant (22.66), leaf length (25.47 cm), leaf width (7.42 cm), leaf area (126.62 cm^2), plant spread (N-S) (78.51 cm) and (E-W) (65.23 cm), fresh weight of shoot (76.14 g), fresh weight of root and rhizome (45.71), dry weight of shoot (10.82 g) dry weight of root and rhizome (6.51 g), total fresh biomass of the plant (121.81 g) and dry matter production of plant (17.19 g) at 240 days after planting. This was followed by T_9 (sand + red earth + vermicompost + leaf mould compost @ 1:1:1/2:1/2, v/v) with the value of 65.84 cm, 83.05, 21.33, 24.21 cm, 7.02 cm, 113.86 cm^2, 74.65 cm and 62.01 cm, 72.43 g, 43.45 g, 10.20 g, 6.13 g, 115.87 g and 16.29 g of plant height, number of leaves per plant, number of suckers per plant, leaf length, leaf width, leaf area, plant spread (N-S) and (E-W), fresh weight of shoot, fresh weight of root and rhizomes, dry

weight of shoot, dry weight of root and rhizomes, total fresh biomass of the plant and dry matter production of plant respectively. While the minimum plant height, number of leaves per plant, number of suckers per plant, leaf length, leaf width, leaf area, plant spread (N-S) and (E-W), fresh weight of shoot, fresh weight of root and rhizome, dry weight of shoot, dry weight of root and rhizomes, total fresh biomass of the plant and dry matter production of plant was recorded with T_{11}- sand + red earth (1:1, v/v) - control (36.06 cm, 45.23, 11.00, 12.92 cm, 3.69 cm, 31.94 cm^2, 40.84 cm, 33.35 cm, 37.65 g, 22.58 g, 5.27 g, 3.16 g, 60.23 g and 8.43 g respectively) (Table 1, Fig 1-2). The enhanced performance of red ginger plants grown in the media containing vermicompost over same media combination without vermicompost could be attributed by the fact that vermicompost contains major and minor nutrients for the plants in available forms besides enzymes, antibiotics, vitamins, beneficial microorganisms, and other plant growth hormones and have definite advantage over other organic manures in respect of growth [7]. It is in line with the reports of [8] who revealed enhanced growth parameters like plant height, number of tillers, number of leaves, leaf area, fresh and dry weight of rhizome per pot in ginger (*Zingiber officinale*) plants grown in potting mixture treated with the combination of vermicompost and coir pith. The reports of [9] in Pistachio nut, [10] in LA Hybrid lily and [11] in *Rosa hybrida* are also conformity of the present research. The better root and shoot growth might be due to the rooting co-factor viz., water holding capacity, aeration and organic matter of the coir pith [12].

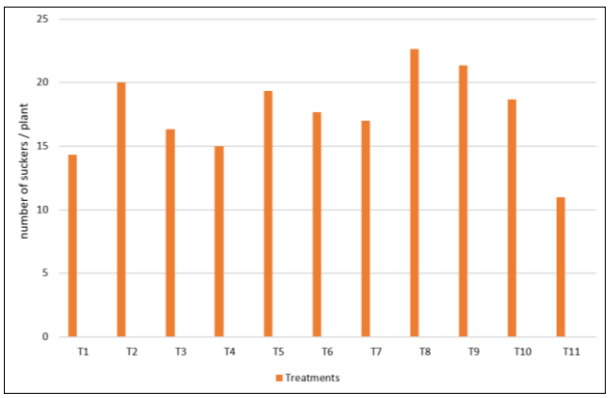

Fig 1 Effect of different media on number of suckers/plant of red ginger (*A. purpurata* (Vieill.) K. Schum.) cut foliage stalks

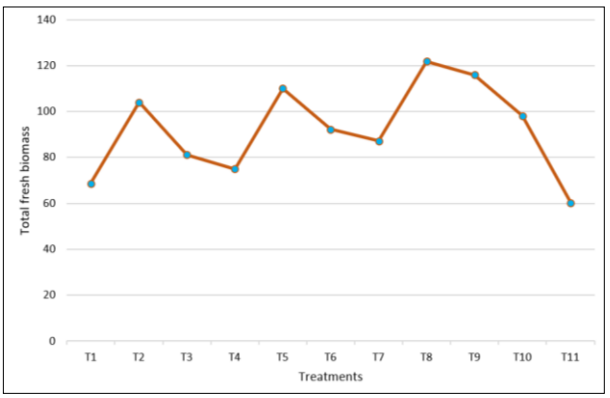

Fig 2 Effect of different media on total fresh biomass of red ginger (*Alpinia purpurata* (Vieill.) K. Schum.)

CONCLUSION

It may be concluded that, growing media mixtures contains, sand + red earth + vermicompost + coirpith @ 1:1:1/2:1/2, v/v (T_8) recorded the maximum plant height, number of leaves per plant, number of suckers per plant, leaf length, leaf width, leaf area, plant spread (N-S) and (E-W), fresh weight of shoot, fresh weight of root and rhizomes, dry weight of shoot, dry weight of root and rhizomes, total fresh biomass of the plant and dry matter production of the plant.

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