

STUDY ON SEASONAL GROWTH PATTERN OF SEEDLINGS OF CERTAIN CITRUS SPECIES AT MID HILL ALTITUDE OF MEGHALAYA

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Citrus in north eastern hill region are being propagated by seed (Ghosh and Singh, 1993) and the entire plantation is based on seeding origin plants. In case of lemons and sweet lime, air layering and even cutting are being employed for raising plants.

The presence of polyembryony in citrus is being exploited by citrus growers for using nucellar seedlings as rootstock to obtain uniform population. However, the growth of citrus seedlings at nursery stage was usually observed to be very slow under mid altitude of Meghalaya. The present investigation was aimed to study the growth behaviour of certain citrus species so that seedling growth could be accelerated at proper stage in nursery through management practices.

The present study was conducted at IRCA Research Complex for NEH Region Umiam, Meghalaya (900 m msl). The soil of the nursery site was acidic with a pH ranging from 4.3 to 5.8, organic matter 1.4 %, exchangeable Ca 120.3 ppm, Mg 14.4 ppm, K 127 ppm, Al 250 ppm and Bray P 2 ppm. Annual rainfall was 2200mm. Freshly extracted seeds of three citrus species viz. *C. jambhiri* (Estes rough lemon) *C. medica* (Soh mad) and *C. sinensis* (Soh nairiang) were sown in nursery beds and after germination, seedlings were transplanted in raised nursery bed of 3x1 m size at the spacing of 30 cm apart in the last week of March. Weeding and spraying of insecticides were done at regular interval to protect the seedlings from the insect pests. Six plants from each treatment were randomly selected for the observations on vegetative growth of plants like height, stem diameter, number of branches and leaves per plant, primary root length, number of secondary roots and dry matter content of roots, leaves and stem at monthly interval beginning from January to December.

A sharp increase in growth of plant (height) was observed in the month of March in all the species under study and thereafter gradually increased upto July August and May which was again increased sharply in the month of September and June in Soh mad, Estes rough lemon and Soh nairiang respectively (Table 1; Fig 1 & 2). The growth behaviour of Soh mad and Estes rough lemon was found to be almost similar. Sudden increase in growth in different months was attributed due to flush period occur during these months. The maximum height and stem diameter was recorded in Soh mad (38.4cm) followed by Estes rough lemon (30.1 cm) and Soh nairiang (27.8 cm) after one year of growth. However, number of branches and leaves/plant were found more in Estes rough lemon followed by Soh mad and Soh nairiang. The length of tap root in all the species sharply increased in March but maintained such trend upto October only in case of Estes rough lemon and Soh nairiang. The number of secondary roots and dry matter contents was increased consistently throughout the year and thus the maximum was recorded in December. The sudden increase in number of roots was noticed in August in Estes rough lemon and Soh nairiang. The study indicated a considerable variation in shoot and root growth of different citrus species at nursery stage even of grown under identical condition. This may be attributed to the genetic make of the species. The trend of total dry matter content of plant was found to be the same way as plant height (Fig 2). Variation in growth characters of different citrus species have also been reported by Sheo Govind and Chandra (1993), Ghosh and Singh (1993) and Tayde & Joshi (1993) under different climatic conditions of country.

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Table 1. Growth and dry matter content in seedling plants of certain citrus species in different months

Species	Character	Months											
		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Estes rough lemon (<i>C.jambhiri</i>)	Plant height, (cm)	9.20	9.5	12.8	13.4	15.1	15.6	18.6	19.6	23.1	28.7	29.4	30.1
Soh mad (<i>C.medica</i>)		16.0	16.3	20.9	22.2	23.1	24.8	26.3	30.6	32.9	36.9	38.0	38.5
Soh nairiang (<i>C.sinensis</i>)		102	11.0	15.6	17.4	19.2	22.2	22.7	23.5	24.7	26.9	27.6	27.9
Estes rough lemon stem (mm)	Diameter of	2.72	2.80	3.07	3.22	3.47	3.86	4.28	4.69	4.79	5.18	5.38	5.45
Soh mad		2.60	2.62	3.11	3.44	3.80	4.51	5.10	5.79	5.90	6.07	6.10	6.16
Soh nairiang		2.34	2.40	2.92	3.15	3.32	3.87	4.30	4.83	5.18	5.23	5.26	5.29
Estes rough lemon	No. Branches/ plant	1.00	1.0	1.14	1.30	1.74	1.74	2.44	3.23	3.87	4.64	4.85	4.90
Soh mad		0.57	0.63	1.0	1.2	1.24	1.30	1.42	2.17	2.56	2.73	2.80	2.84
Soh nairiang		0.20	0.2	0.21	0.29	0.85	1.1	1.17	1.24	1.26	1.29	1.31	1.32
Estes rough lemon	No. of Leaves/ plants	14.90	15.31	22.30	22.84	23.55	25.27	32.11	34.53	38.01	42.01	42.50	43.02
Soh mad		14.23	14.33	22.27	23.47	24.37	26.36	20.11	31.97	32.93	34.02	34.20	34.45
Soh nairiang		8.37	9.43	14.43	15.17	15.70	18.00	19.50	21.42	22.63	25.50	27.46	27.57
Estes rough lemon	No. of secondary roots	29.10	30.52	34.50	35.53	37.67	42.43	43.02	47.17	49.10	51.50	51.70	51.73
Soh mad		20.77	22.50	30.47	31.37	33.73	35.45	35.79	36.34	37.44	40.99	41.03	41.80
Soh nairiang		21.35	22.17	28.47	30.30	32.71	33.53	35.00	41.00	43.58	48.31	48.00	48.17
Estes rough lemon	Dry matter stem (g)	0.43	0.45	0.64	0.68	0.73	1.27	1.49	1.57	1.81	2.61	2.70	2.75
Soh mad		0.68	0.73	1.07	1.24	1.34	1.62	2.35	3.16	4.22	4.69	4.66	4.83
Soh nairiang		0.45	0.48	0.82	0.90	1.04	1.25	1.72	1.80	1.91	1.95	1.97	1.97
Estes rough lemon	Dry matter roots (g)	0.43	0.47	0.62	0.67	0.91	1.30	1.79	2.29	2.66	3.20	3.32	3.44
Soh mad		1.43	1.50	2.17	2.58	2.68	2.83	3.35	3.84	4.07	5.03	5.19	5.19
Soh nairiang		0.92	0.96	1.27	1.39	1.93	2.26	2.33	2.34	2.49	2.81	2.86	2.88
Estes rough lemon	Dry matter leaves(g)	0.90	0.94	1.05	1.16	1.31	1.39	1.44	1.56	1.60	2.29	2.47	2.59
Soh mad		1.12	1.20	1.73	1.86	1.93	2.13	2.44	2.53	2.92	3.37	3.48	3.50
Soh nairiang		0.51	0.55	0.73	0.80	1.04	1.39	1.52	1.73	1.85	1.97	2.02	2.06
Estes rough lemon	Total dry matter of plant (g)	1.76	1.86	2.31	2.51	2.95	3.96	4.72	5.42	6.07	8.1	8.49	8.75
Soh mad		3.23	3.43	4.97	5.68	5.95	6.58	8.14	9.53	11.21	13.09	13.33	13.52
Soh nairiang		1.88	1.99	2.82	3.09	4.01	4.9	5.57	5.87	6.25	6.73	6.85	6.91