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Research Paper

Impact of climate change on Endemic tree species of genus *Garcinia* at Andaman & Nicobar Islands

C. S. Purohit[1]*, C. P. Vivek[2], B. C. Dey[3], K. Jain[4] and L. J. Singh[5]
[1]Botanical Survey of India, Arid Zone Regional Centre, Jodhpur, Rajasthan, India
[2]Botanical Survey of India, Headquarter, Kolkata, India
[3]Botanical Survey of India, AJCB Indian Botanical Garden, Howrah, India
[4]Department of Botany, Jai Narayan Vyas University, Jodhpur, Rajasthan, India
[5]Botanical Survey of India, Andaman & Nicobar Regional Centre, Port Blair
*Corresponding author email: chandansinghpurohit@yahoo.com

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Abstract: *Garcinia* L. is a well-recognised genus of family Clusiaceae for it has commendable economic importance as a source of edible fruits. The genus is represented by 250 species in the world (Rogers & Sweeney, 2007; Sweeney, 2008; Sharma *et al*., 2013; Nimanthika & Kaththriarchi, 2010), and in India by 43 species (Anderson, 1874; Maheshwari, 1964; Singh, 1993; Srivastava, 1994). It has 17 members in the Andaman and Nicobar Islands including 7 endemics such as *G. andamanica* King, *G. cadelliana* King, *G. calycina* Kurz, *G. dhanikhariensis* S.K. Srivastava, *G. kingii* Pierre ex Vesque, *G. kurzii* Pierre, and *G. microstigma* Kurz (Hazara *et al*., 1999; Sinha, 1999; Pandey & Diwakar, 2008; Murugan *et al*., 2016; Purohit & Vivek, 2022; Purohit *et al*., 2022 & 2023). Out of 7 endemics, *G. andamanica* and *G. dhanikhariensis* is highly restricted in Andaman group of Islands. It has potential of using as a fruit crop and ornamental tree.

Present study is on focus of *ex-situ* conservation of genus *Garcinia* i.e. *G. andamanica* & *G. dhanikhariensis* through seeds germination or seedlings collections from their natural habitats and conservation at Dhanikhari garden. *G. andamanica* has been naturally occur at evergreen forest near fresh water bodies and damp areas of little, North & South Andaman Islands. *G. dhanikhariensis* has been restricted in inland forest at Dhanikhari area in South Andaman and few individuals in cultivation at Chouldhari area in South Andaman Islands. Present paper deals with study of seed germination, growth behavior and effect of climate change on two endemic tree species i.e. *G. andamanica* King and *Garcinia dhanikhariensis* S.K. Srivst. (Clusiaceae) at Dhanikhari Botanical Garden cum Arboretum, Port Blair.

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Keywords: Endemic, Garcinia, Growth data, Climate change, conservation.

Introduction: *Garcinia* L. is a well-recognised genus of family Clusiaceae for it has commendable economic importance as a source of edible fruits. The genus is represented by 250 species in the world (Rogers & Sweeney, 2007; Sweeney, 2008; Sharma *et al*., 2013; Nimanthika & Kaththriarchi, 2010), and in India by 43 species (Anderson, 1874; Maheshwari, 1964; Singh, 1993; Srivastava, 1994). It has 17 members in the Andaman and Nicobar Islands including 7 endemics such as *G. andamanica* King, *G. cadelliana* King, *G. calycina* Kurz, *G. dhanikhariensis* S.K. Srivastava, *G. kingii* Pierre ex Vesque, *G. kurzii* Pierre, and *G. microstigma* Kurz (Hazara *et al*., 1999; Sinha, 1999; Pandey & Diwakar, 2008; Murugan *et al*., 2016; Purohit & Vivek, 2022; Purohit *et al*., 2022 & 2023). Out of 7 endemics, *G. andamanica* and *G. dhanikhariensis* is highly restricted in Andaman group of Islands. It has potential of using as a fruit crop and ornamental tree.

Garcinia dhanikhariensis was first described by S.K. Srivastava in 1994, collected from the Nayasahar forest in the Dhanikhari area of South Andaman Island. The specific epithet 'dhanikhariensis' was given in reference to its type locality. Recently, three studies were published regarding seed germination and fatty acid content (Bohra *et al.*, 2021), leaf anatomy (Devi & Jayakumar, 2022) and report new location in Andaman Islands & their IUCN red list assessment (Purohit et al, 2025). The present authors have worked on growth behavior during the years 2019 to 2023 and correlate with climate data. These plants were found distributed in and around the type locality at Nayasahar, with a few individuals cultivated in the Chouldhari area, nearly 12 km from the type locality.

Taxonomic Treatment:

Garcinia dhanikhariensis S. K. Srivast.: Evergreen tree, *c*. 8 m high. Bark greyish to black, old ones flaked; exudation milky; crown pyramidal with horizontal spreading branches. Branchlets warted at nodes, brown when dry, glabrous. Leaves 9–14 × 3–5 cm, opposite, elliptic or elliptic-lanceolate, apex acuminate, base cuneate, margin entire, thinly coriaceous, upper surface slightly glossy, lower rather dull; midrib prominent beneath; lateral nerves 9–12 pairs, obscure above, visible beneath; petiole *c.* 5 mm long, channelled. Male flowers 1.2 cm across, solitary or in fascicles of three, actinomorphic, red in colour, bracteolate; bracteoles 2, ovate, mucronate, attached at the base of the sepal; pedicel 5–6 mm long. Sepals 4, 3–4 mm long, jointed at the base, imbricate, persistent, fleshy, glabrous. Petals 4, 5–7 × 4–5 mm, oblong, broadly ovate, obtuse, crimson-red, glabrous. Stamens 12 in 4 bundles of 3 stamens each, 3–4 mm long, staminal bundles opposite to sepals, anthers dithecous, introse, unilocular, dorsifixed; filament 2–3 mm long. Ovary globose, *c.* 5 mm diam., 5-locular; style sessile; stigma of the rudimentary pistil with 6–7 radiating lobes. Berry subglobose, 2.5–5 cm in diam., reddish to purplish when ripen, sepals persistent, pulp is yellowish (Fig. 1: A & B).

Flowering & fruiting: January–April.

Distribution: India; Andaman and Nicobar Islands: South Andaman, Nayasahar, Chouldhari..

IUCN Red List Assessment: Endemic & Critically Endangered (Purohit et al. 2025).

Result and Discussion: Seeds of *Garcinia dhanikhariensis* sowing in polybags and noted the germination percentage (Fig. 1: C,

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D & E). After germination, five replicates in polybags keep in separate place in the garden under monitoring and watering when require. Start to record growth data weekly i.e. length of stem and number of leaf initiation after germination of seeds and tabulate these data in excel sheets. These data recorded up to 901 days after germination of seeds. Same days when data recorded, download climate data i.e. temperature, humidity and rainfall of Port Blair from online world climate data and tabulate in excel sheets. Simultaneously both data keep in one table and prepare 12 graphs showing relation of climate data with growth behavior after germination. All 12 graphs with explanation are follows:

(1) Growth behaviour of *Garcinia dhanikhariensis* with temperature (Graph-1): Graph-1 shows that the temperature ranged from 28ºC – 29ºC in the nursery area during first 90 days after seedling plantation. Average 9 cm seedling growth rate recorded during this period. The maximum temperature almost same up to 29ºC and minimum up to 23ºC recorded between 91 to 195 days of seedling plantation with slow seedlings growth. Here the seedlings are recorded with only 3.6 cm increment. During 196 – 400 days high difference in minimum & maximum temperature was recorded (temperature range is between 21ºC – 28ºC and 28 ºC – 31ºC respectively) and plant height increased up to 21.04 cm (out of five replicate, one plant growth was increased suddenly very high up to 49.5 cm). Seedling growth remarkable decreased proportional to the temperature fall, ranging between 20ºC to 26ºC. Seedlings showed slow growth up to 2.8 cm only between 401 – 645 days. Rise in minimum temperature up to 27ºC and maximum temperature up to 30ºC after 645 days of seedling plantation observed, simultaneously with plant height increament up to 5.12 cm during 646 – 900 days.

Conclusion:

The graph-1 shows the growth behavioural pattern of *Garcinia dhanikhariensis* seedlings in nursery. The growth varies in four major ways according to the maximum and minimum temperature regim of study area

The seedlings grew maximum when the minimum and maximum temperature difference is gradually decreasing.

The seedlings growth slowed when minimum and maximum temperature difference is gradually increasing.

The seedlings grew gradually when the minimum temperature fluctuate and maximum temperature remain same.

When the maximum and minimum temperature fluctuate abruptly and decrease steeply, the seedlings showed fluctuating growth pattern presumably due to temperature related climatic factors.

(2) Growth behaviour of *Garcinia dhanikhariensis* with Rainfall (Graph-2): The rainfall ranged between 0 – 32.4 mm in the first 30 days of seedling plantation during which the seedlings growth up to 6.8 cm average. The rainfall decrease up to 0.3 mm or no rainfall during 31 – 195 days of seedlings plantation with slow plant height growth up to 12.6 cm which is 5.8 cm in a 165 days. At this point low rainfall recorded. The seedling growth increased gradually up to 21.08 cm after 195 days onwards to 405 days when the rainfall ranged between 0.9 mm to 57.8 mm. Seedling growth remarkable decreased proportional low rainfall or no rainfall with 2.14 cm height increment in 175 days duration between 406 – 580 days. When the abrupt high rainfall (51.6 mm in a day) after 580 days of seedling plantation height increased very slow up to 0.62 cm during 65 days duration

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between 581 – 645 days. When the rainfall gradually increase up to 51.4 mm after 645 days of seedling plantation height gradually increase up to 2.08 cm in coming 75 days i.e. 646 – 720 days. Drastic fall of rainfall less than 2 mm per day observed between 721 – 900 days simultaneously with slower seedling growth and and reaches up to 29.1 cm.

Conclusion: The graph-2 shows the growth behavioural pattern of *Garcinia dhanikhariensis* seedlings in nursery. The growth varies in four major ways according to the effects of high and low rainfall regim of study area

The seedlings shows high growth when the rainfall is suddenly high with repeated intervals.

The seedlings shows slow growth when the rainfall suddenly fall and less than 2 mm in a day.

The seedlings shows gradually increase growth when the rainfall graudally increase in a intervals.

When the rainfall per day fluctuate abruptly and decrease steeply, the seedlings undergo fluctuating growth pattern presumably due to rainfall related climatic factors.

(3) Growth behaviour of *Garcinia dhanikhariensis* with Humidity (Graph-3): The maximum Humidity in the nursery area was 82% in the first 40 days of seedling plantation with average seedling growth up to 7 cm. The humidity fluctuated with decrease up to 79% during 41 – 135 days of seedling plantation with very slow height growth up to 9.54 cm with only 2.54 cm growth in a 95 days. At this point abrupt Humidity fall was observed. The seedling growth increased up to 20.68 cm after 135 to 390 days when the maximum Humidity range between 80% – 85%. Seedling growth remarkable decrease with only 3.76 cm height increment in proportion to humidity fall up to 61% showing poor seedling growth in 270 days duration between 391 – 660 days. When the rainfall gradually increase in a intervals, humidity also gradually increase up to 83% during 661 – 735 days of seedling plantation, height gradually increase up to 2.2 cm in coming 75 days. The graph shows sudden decrease of humdity up to 67% due to rainfall reduction less than 2 mm per day in between 736 – 900 days along with seedlings growth reduction.

Conclusion: The graph-3 shows the growth behavioural pattern of *Garcinia dhanikhariensis* seedlings in nursery. The growth varies in four major ways according to Humdity regim of area

The seedlings shows high growth when the humdity increase in a range of 80% – 85% and seedlings shows slow growth when the Humdity fall.

The seedlings grows when humidity is more than 75% and growth reduces with humdity less than 75% per day.

The seedlings shows high growth with gradually increase humdity and slow growth with gradually decrease humidity.

When the Humidity fluctuate abruptly and decrease steeply (more than 15% – 20% difference), OR the Humidity fluctuate minutely (less than 5% difference), the seedlings undergo growth pattern fluctuation presumably due to other climatic factors effective with humidity fluctuation.

(4) Leaf initiation of *Garcinia dhanikhariensis* with temperature (Graph-4): The maximum and minimum temperature difference ranged 1ºC – 3ºC in the nursery area during first 90 days of seedling plantation with average leaves initation of 9.8 leaves per plant during this period. Both maximum and minimum temperature decreased 2ºC – 3ºC, the plant biomass also decreased and average of 0.8 leaf fall per plant during 91 – 140 days of seedling plantation. Seedling growth and

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biomass incresed with average of 3.4 leaves per plant during the 141 – 180 days duration. During this duration increase 3ºC – 5ºC difference between minimum and maximum temperature and high biomass gain was observed. Seedling growth and biomass increased gradually with average of 22.4 leaves per plant with an average increase of 8.4 leaves during the 181 – 560 days duration. During this duration higher difference between minimum and maximum temperature and gradually increase biomass was observed. Seedling growth remarkable decreased proportional to the minimum and maximum temperature increase up to 28ºC and 31ºC, respectively, showing poor seedling growth with an average 4.2 leaf fall during 100 days falling between 561 – 660 days. Seedling growth biomass increase gradually with an average of 21.6 leaves per plant with an average increase of 3.4 leaves during 661 – 705 days duration. During this duration decrease up to 3ºC – 5ºC both minimum and maximum temperature and biomass gain was observed. The minimum temperature decreases up to 22ºC and maximum temperature remain same up to 28ºC after 705 days of seedling plantation. Here the leave number increased per plant to an average of 1.6 during 30 days between 706 – 735 days. The graph shows a drastic fall and increase of minimum and maximum temperature between 736 – 900 days and average number of leaves also differ ±1.6 leaves per plant with slow growth and less biomass during this period.

Conclusion: The graph-4 shows the leaf initiation behavioural pattern of *Garcinia dhanikhariensis* seedlings in nursery. The average numbe of leaves varies in four major ways as per the maximum and minimum temperature regim of the study area

The seedlings shows higher average number of leaves per plant when the difference between minimum and maximum temperature is gradually decreasing.

The seedlings shows decrease average number of leaves per plant or leaf fall when difference between minimum and maximum temperature is gradually decreasing.

When the maximum remain same and minimum temperature fluctuate abruptly and decrease steeply, the average number of leaves per plant gradually increasing.

When the maximum and minimum temperature fluctuate abruptly and decrease steeply, the average number of leaves per plant undergo fluctuation in leaf initiation pattern which is presumed to be the effect of other climatic factors effective with temperature fluctuation.

(5) Leaf initiation of *Garcinia dhanikhariensis* with rainfall (Graph-5): The rainfall ranged between 0 – 32.4 mm during the first 100 days of seedling plantation in the nursery area. Average 9.8 leaves initiation per plant recorded during this period. The rainfall decrease up to 1.5 mm or no rainfall during 101 – 200 days of seedling plantation. After which, leaf fall with an average of 5.8 leaves per plant observed during the 100 days falling between 101 – 200 days of seedling plantation. At this point low or no rainfall was recorded. Seedling growth increased with and average of 13 leaves per plant in 480 days depicting average 7.2 leaves per plant during 201 – 480 days. At this point, minimum and maximum rainfall of 0.6 mm and 57.8 mm, respectively observed when the plant gain higher biomass. Seedling growth decreased proportional to the reduced or no rainfall with poor seedling growth and average 1.4 leaves decrease per plant by leaf fall in 50 days falling between 481 – 530 days. Seedling growth shows sudden increase proportional to the no rainfall. Which means sudden increase biomass of seedlings and average 3.4

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number of leaves increase per plant in 15 days i.e. between 531 – 545 days. With the sudden high rainfall (51.6mm in a day) after 545 days of seedling plantation, decrease biomass and number of leaves per plant up to an average 5.4 during 120 days falling between 546 – 665 days was observed. At this point graph shows during a month most of time no rainfall and 1 or 2 sudden high rainfall. With sudden high rainfall (39 mm to 51.6 mm in a day) after 665 days of seedling plantation biomass enhanced due to increase in average 21.2 leaves per plant during 100 days between 666 – 755 days. It means average 3 leaves per plant increase during that time. The graph shows a drastic rainfall reduction less than 2 mm per day in between 756 – 900 days and seedling growth also slowed down. At this point average 0.2 leaves initiate per plant in 145 days duration between 756 – 900 days.

Conclusion: The graph-5 shows the leaf initiation behavioural pattern of *Garcinia dhanikhariensis* seedlings in nursery conditions. The average numbe of leaves varies in three major ways according to the effects of high and low rainfall regim of study area

The seedlings shows higher average number of leaves per plant when the rainfall is suddenly high and repeat in a few days intervals.

The seedlings shows decrease average number of leaves per plant or leaf fall when the rainfall fall is less than 2 mm in a day.

The seedlings shows higher average number of leaves per plant difference when the rainfall suddenly fall and less than 2 mm in a day. OR the seedlings shows decrease average number of leaves per plant or leaf fall when the rainfall is suddenly high and repeat in a few days intervals. In both condition which is presumed to be the effect of other climatic factors effective with rainfall fluctuation.

(6) Leaf initiation of *Garcinia dhanikhariensis* with Humidity (Graph-6): The maximum Humidity was 82% with an of average 76% during first 110 days in nursery area of seedling plantation. Average 10 leaves per plant initiation during this period. The humidity fluctuation and decrease up to 65% during 111 – 240 days of seedling plantation observed. Average of 6.4 leaves per plant initiation observed during 130 days between 111 – 240 days. At this point graphs shows sudden fall in maximum Humidity. Seedling growth increased gradually with average 13 total number of leaves per plant in 480 days showing an average of 5.4 leaves initiation per plant during 200 days between 241 – 480 days. At this point graphs shows the maximum Humidity increase up to 85% and average humidity increase up to 78% and plant gained biomass. Seedling growth remarkable decrease proportional to declining humidity up to 73% showing poor seedling growth with average 1.4 leaves per plant due to leaf fall in 50 days between 481 – 530 days. Seedling growth shows sudden increase proportional to the decrease humidity due to no rainfall showing increase biomass of seedling with an average 3.4 leaves per plant initiate in 15 days between 531 – 545 days. Seedling growth remarkable decrease proportional to sudden declining humidity up to 61% oe sudden increase (80% – 83% in a day) in a interval showing poor seedling growth with average 5.4 leaves per plant due to leaf fall in 120 days between 546 – 665 days. When the sudden high rainfall after 665 days of seedling plantation, humidity increased up to 86%. Here increased biomass and average 21.2 leaves per plant observed during 90 days between 666 – 755 days. This shows average 3 leaves per plant increased indicating biomass increase. The graph shows humdity declining up to 78% due to a

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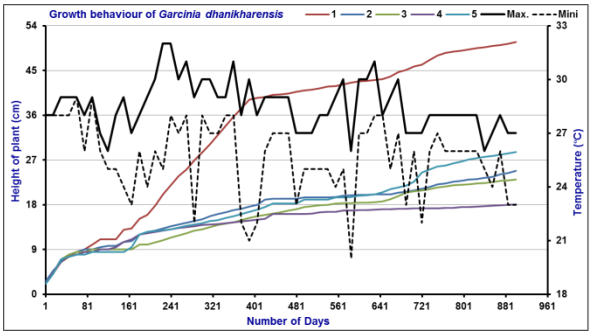
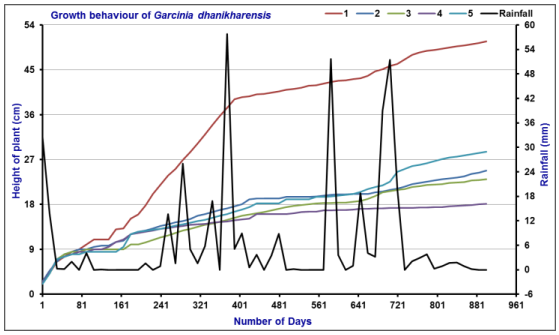
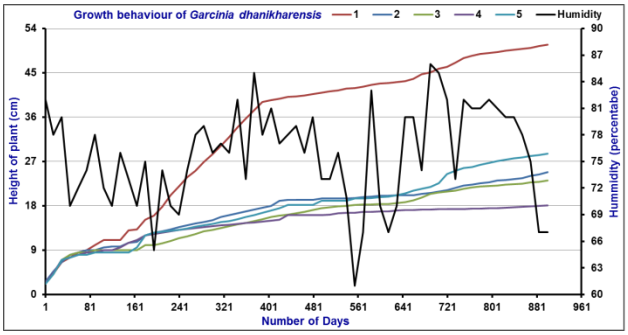
rainfall reduction in between 756 – 900 days and as a consequence seedling growth also reduced. At this point graph shows slightly increase to an average 0.2 leaves per plant initiate in a gap of 756 – 900 days.



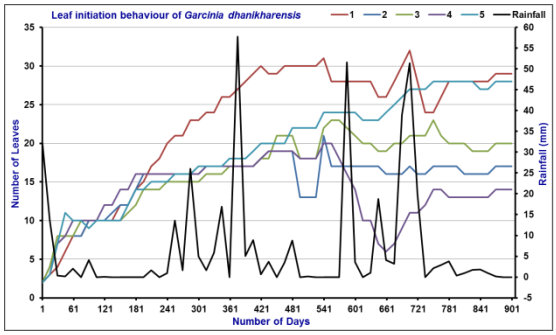
Graph-1: shows growth behaviour of *Garcinia dhanikhariensis* with temperature



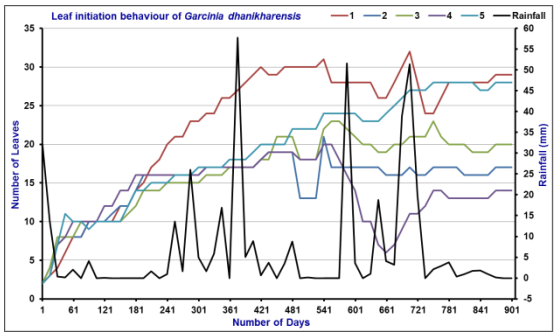
Graph-2: shows growth behaviour of *Garcinia dhanikhariensis* with Rainfall



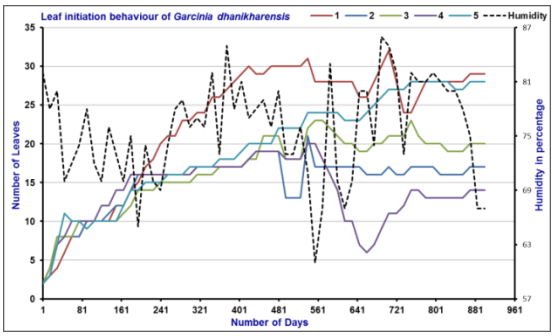
Graph-3: shows growth behaviour of *Garcinia dhanikhariensis* with Humidity



Graph-4: shows Leaf initiation behaviour of *Garcinia dhanikhariensis* with temperature



Graph-5: shows Leaf initiation behaviour of *Garcinia dhanikhariensis* with Rainfall



Graph-6: shows Leaf initiation behaviour of *Garcinia dhanikhariensis* with Humidity

Conclusion: The graph-6 shows the leaf initiation behavioural pattern of seedlings of *Garcinia dhanikhariensis* in nursery. The average numbe of leaves varies in four major ways according to the effects of increase and decrease Humdity regim of study area.

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The seedlings shows higher average number of leaves per plant when the humdity is suddenly increase in a range of 80% – 85%.
The seedlings shows slow growth and leaf fall when the Humdity fall down in between 61–67%.
The seedlings shows slow growth and slightly increase number of leaves when the humidity fall down in between 73% – 77%.
The seedlings shows higher average number of leaves per plant when the average humdity is more than 78% or leass than 72 %.

(7) Month-wise growth of height of *Garcinia dhanikhariensis* with number of days and temperature (Graph-7): The graph-7 shows the growth behavioural pattern (height) of *Garcinia dhanikhariensis* seedlings in every month in nursery conditions. The growth varies in two major ways according to the effects of maximum and minimum temperature regim of study area. The graph-7 shows, difference between average monthly minimum and maximum temperature not more than 5ºC and average monthly minimum temperature not below 24ºC favoured seedling growth showing remarkable growth during the August, September and October of every year and height increased every month reaching maximum up to 5.5 cm in a month. The graph-7 shows difference between average monthly minimum and maximum temperature more than 5ºC and average monthly minimum temperature 24ºC or below was not favourable condition for seedling growth showing poor growth during November and December of every year and it lead to maximum up to only 0.5 cm height in a month.

(8) Month-wise growth of height of *Garcinia dhanikhariensis* with number of days and Rainfall (Graph-8): The graph-8 shows the growth behavioural pattern (height) of *Garcinia dhanikhariensis* seedlings in every month under nursery conditions. The growth varies in three major ways according to the effect of maximum and minimum rainfall regim of study area. The graph-8 show that average monthly rainfall range 300 mm – 500 mm favoured seedling growth showing remarkable growth during June, August, September month of every year and height increased reaching to maximum 5.3 cm in a month. The graph-8 show that when average monthly rainfall reduced up to 100 mm or stopped was not favourable for seedling growth leading to poor growth during November, December and January month of every year showing maximum only up to 0.8 cm height in a month. The graph-8 shows that when average monthly rainfall flactuate between 100 mm to 300 mm rainfall, the seedlings undergo fluctuation in growth pattern which is presumed to be the effect of other climatic factors effective with rainfall fluctuation.

(9) Month-wise growth of height of *Garcinia dhanikhariensis* with number of days and Humidity (Graph-9): The graph-9 shows the growth behavioural pattern (height) of *Garcinia dhanikhariensis* seedlings at monthly intervals in nursery conditions. The growth varies in two major ways according to the humidity regim of study area. The graph-9 shows, average monthly humidity 80% and above favoured seedling growth showing remarkable growth during June, July, August, September and October of every month of every year and height increased reaching to maximum 5.3 cm in a month. The graph-9 shows that with average monthly humidity 70% and below was not favourable for seedling growth leading to poor growth during Novermber, December and Januayr month of every year, showing maximum only up to 0.8 cm height in a month.

(10) Month-wise leaf initiation of *Garcinia dhanikhariensis* with number of days and

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temperature (Graph-10): The graph-10 shows the leaf initiation behaviour pattern (monthly average number of leaves) of *Garcinia dhanikhariensis* seedlings in in nursery conditions. The monthly average number of leaves varies in two major ways according to the maximum and minimum temperature regim of study area. The graph-10 shows, difference between average monthly minimum and maximum temperature not more than 5ºC and average monthly minimum temperature not below 24ºC favoured leaf initiation with remarkable biomass increase and monthly average number of leaves increase reaching maximum up to average 4.5 leaves in a month. July and September month of every year was favourable for biomass and number of leaves increase because of new leaf initiate. The graph-10 shows, difference between average monthly minimum and maximum temperature above 5ºC and average monthly minimum temperature 24ºC or below was not favourable for leaf initiation, instead leaf fall observed in seedlings. No leaf initiation observed and monthly average number of leaves decreased to 2. December and January month of every was unfavourable for growth and biomass decrease as leaf fall start due to average monthly minimum and maximum temperature difference of more than 5ºC.

(11) Month-wise leaf initiation of *Garcinia dhanikhariensis* with number of days and Rainfall (Graph-11): The graph-11 shows the monthly leaf initiation behaviour pattern (average number of leaves) of *Garcinia dhanikhariensis* seedlings in nursery conditions. The average number of leaves varies in two major ways according to the maximum and minimum rainfall regim of study area. The graph-11 shows monthly rainfall range 300 mm – 500 mm favour seedling leaf initiation showing remarkable biomass increase and monthly average number of leaves increase up to 4.5 in a month observed. August, September and October month of every year was favourble for increase in biomass and number of leaves due to new leaf initiation because of rainfall more than 300 mm or more in a month. The graph-11 shows, monthly rainfall 92.2 mm or below as unfavourable condition for leaf initiation and leaf fall takes place. No leaf initiation and reduction in average number of leaves up to 2 in a month observed. May and June month of every year was unfavourable for leaf initiation and biomass decreased as leaf fall start due to rainfall reduction below 92 mm in a month.

(12) Month-wise leaf initiation of *Garcinia dhanikhariensis* with number of days and Humidity (Graph-12): The graph shows, leaf initiation pattern (average number of leaves) of *Garcinia dhanikhariensis* seedlings at month intervals under nursery conditions. The average number of leaves varies in two major ways as per the humidity regim of the study area. The graph shows, average monthly humidity 78% and above favoured biomass and leaf initiation. Graphs shows during these conditions, average number of leaves increase up to 4.5 in a month. August and October month of every year was favourable for leaf initiation and biomass increase as average humidity increase.

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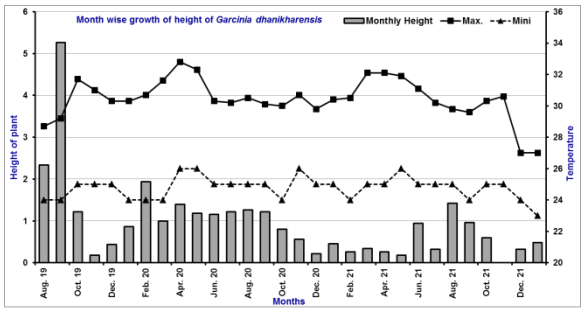
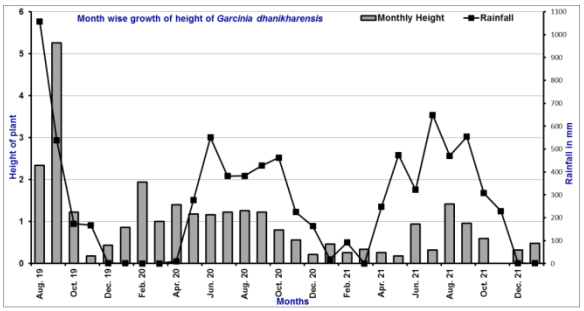
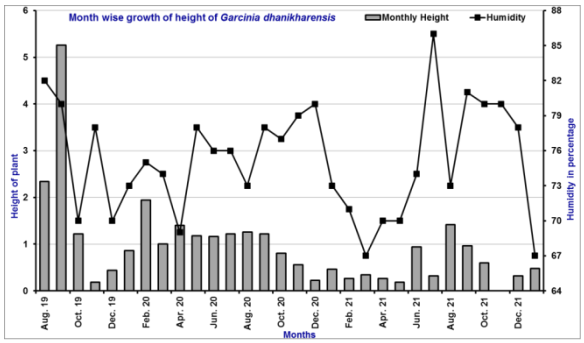


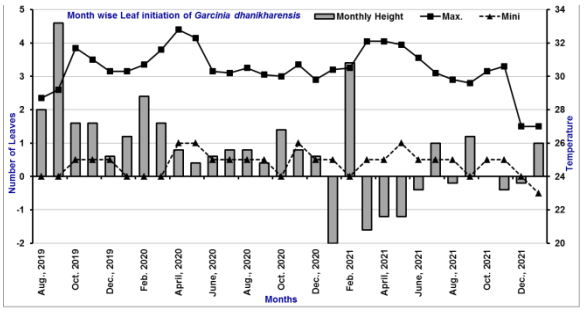
Graph-7: shows month-wise growth of height of *Garcinia dhanikhariensis* with number of days and temperature



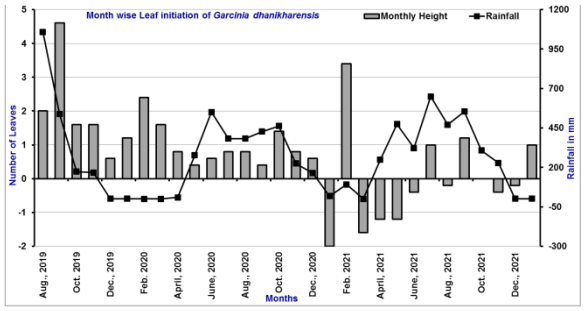
Graph-8: shows month-wise growth of height of *Garcinia dhanikhariensis* with number of days and Rainfall



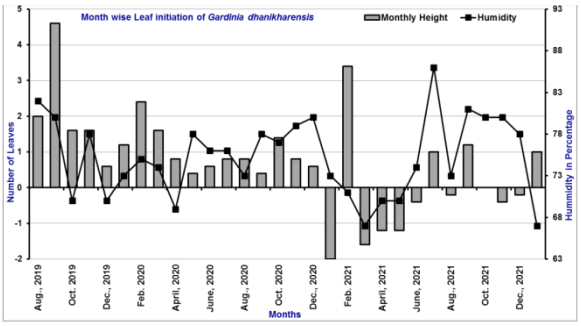
Graph-9: shows month-wise growth of height of *Garcinia dhanikhariensis* with number of days and Humidity



Graph-10: shows month-wise leaf initiation of *Garcinia dhanikhariensis* with number of days and temperature



Graph-11: shows month-wise leaf initiation of *Garcinia dhanikhariensis* with number of days and Rainfall



Graph-12: shows month-wise leaf initiation of *Garcinia dhanikhariensis* with number of days and Humidity

The graph shows, average monthly humidity 70% and below, was unfavourable for leaf initiation and leaf fall occur. With no leaf initiation average number of leaves decreased up to 2 in a month. April, May and June month of every year was unfavourable for leaf initiation and biomass decrease due to leaf fall as average humidity fall.

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Conclusion: Garcinia dhanikhariensis has significant potential for domestication and commercialization as a fruit crop in the Andaman and Nicobar Islands. However, its natural habitat is highly confined and under various threats which required proper conservation management. Therefore, the authors attempted an effective approach for mass propagation of seedlings in polybags. Seeds were collected from fully ripened fruits. Approximately 500 seeds of this species were sown in polybags, and the germination rate and growth data were monitored weekly at the Dhanikhari Experimental Garden cum Arboretum of the Botanical Survey of India, Andaman and Nicobar Regional Centre. Compare growth data with climate data shows that the climate effect the growth and leaf initiation of this plant. High rainfall directly effect to leaf initiation and sudden fluctuation of high temperature induce the fast growth of this stem. The difference between minimum & maximum temperature is decrease to induce the high growth of plant & if difference increase to induce slow growth. Rainfall also effect the growth when 50mm per day rainfall effect the high growth of plant and less induce slow growth. All these data shows that high rainfall with minimum difference of max. & mini. temperature show positive effect on plant and seedlings shows high growth and if condition reverses to effect growth of seedlings very slow.

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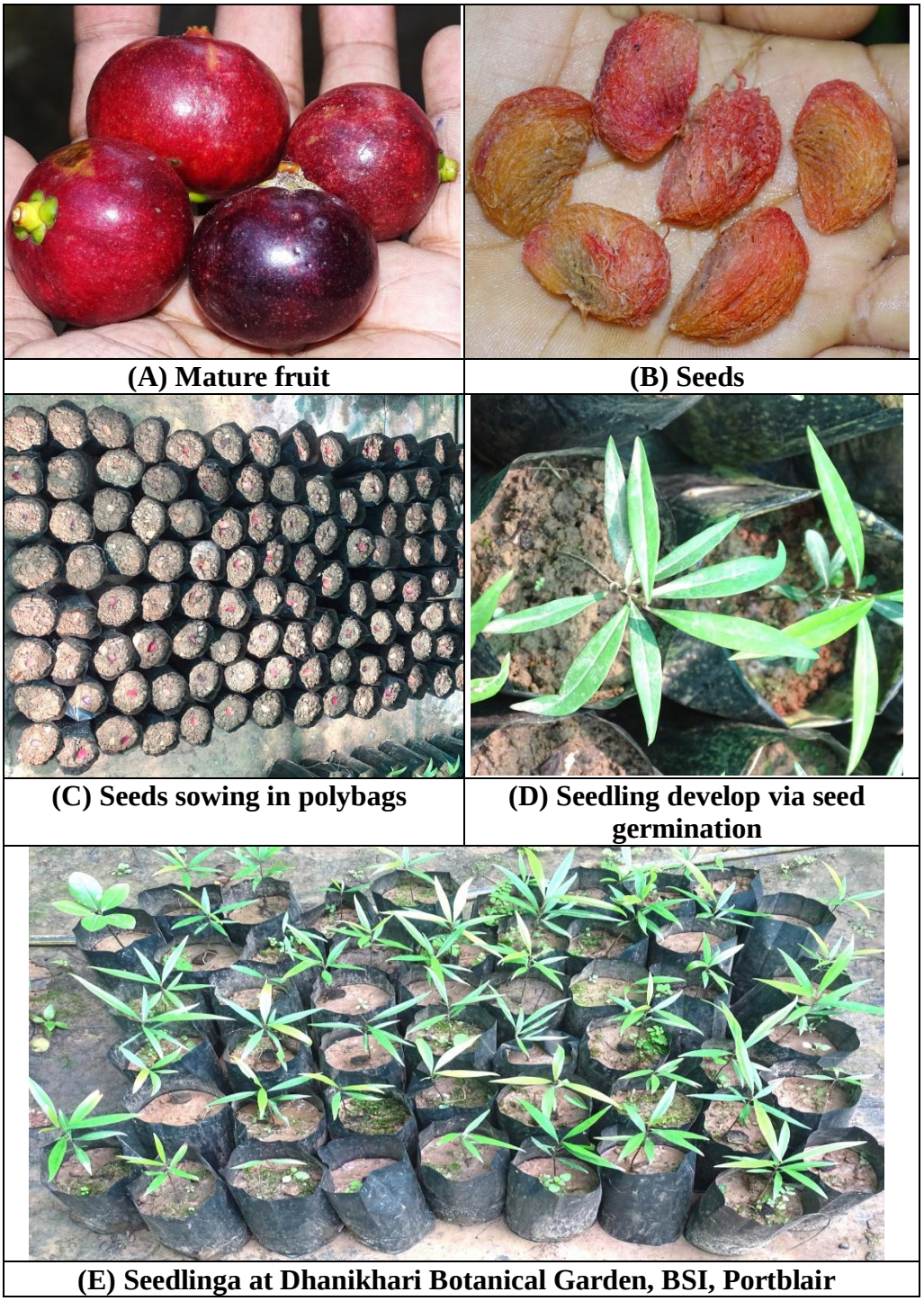

Figure: 1. ***Garcinia dhanikhariensis:*** (A): Mature fruit; (B): Seeds; (C): Seeds sowing in polybags; (D): Seedling develop through seed germination; (E): Seedlinga at Dhanikhari Botanical Garden, BSI, Portblair. (Photos @ C.S. Purohit).