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# Response of Soursop (*Annona muricata* L.) to Clonal Multiplication through Budding and Rootstock Compatibility

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## ABSTRACT

A research trial was carried out at the College of Horticulture, Mysuru, University of Horticultural Sciences, Bagalkot, Karnataka, India during January–June 2021 to study the effect of different environmental conditions and rootstocks on success and survival of soursop budlings. There were 6 treatment combinations consisting of different rootstocks of *Annona sp.* (*Annona muricata* and *Annona squamosa*) along with growing conditions (polyhouse, 50% shade net and open condition) were replicated thrice in factorial completely randomized design. The results of the study indicated that soursop scion budded on its own rootstock (*A. muricata*) and placed under polyhouse condition had significantly affected on days taken to bud sprout (34.96 days), success (91.60%), survival percentage (85.30%) and growth parameters like number of leaves (3.81, 6.56 and 13.67), length of sprouted shoot (3.58 cm, 8.19 cm and 15.42 cm), girth of sprouted shoot (1.35 mm, 1.86 mm and 2.08 mm), number of nodes (3.52 , 6.11 and 11.67) and length of internode (1.20 cm, 1.47 cm and 1.73 cm) at 60, 90 and 120 days after budding whereas *A. muricata* scion budded on *A. squamosa* rootstock kept under open condition recorded more number of days for sprouting (37.86), least success (37.86%), survival percentage (85%) and growth parameters like number of leaves (2.33, 4.44 and 11.11), shoot length (2.78 cm, 5.51 cm and 11.13 cm), diameter of shoot (0.70 mm, 1.01 mm and 1.24 mm), number of nodes (2.11, 4.33 and 10.22) and node length (0.84 cm, 1.01 cm and 1.42 cm).

**KEYWORDS:** Patch budding, success, survival, environmental condition, rootstock, *Annona*

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***Data Availability Statement:*** Legal restrictions are imposed on the public sharing of raw data. However, authors have full right to transfer or share the data in raw form upon request subject to either meeting the conditions of the original consents and the original research study. Further, access of data needs to meet whether the user complies with the ethical and legal obligations as data controllers to allow for secondary use of the data outside of the original study.

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## 1. INTRODUCTION

Soursop (*Annona muricata* L.), an evergreen tree species belongs to the family Annonaceae which bears the largest fruit among Annonas (Maheswari and Sinduja, 2020). This family has important economic value such as fresh fruit, cosmetics, timber, perfumes etc (Mohadamtousi et al., 2015). It is a native of Central America and is called by different names like graviola, pawpaw, sirsak, guanabana etc (Fuenmayor et al., 2016). Itis a unique and emerging tropical fruit species thatoccupies a promising position in today's fruit market due to its enormous potential for use in pharmaceutical industries (Liu et al., 2016). Among the fruits of Annonaceae family custard apple is considered to have the commercial importance as fresh fruit (Kadam et al., 2018) and soursop as the pharmaceutical fruit (Gavamukuluya et al., 2017) as it contains antioxidant (Agu et al., 2017), anticancer (Mohadamtousi et al., 2014, Cascaes et al., 2021), antitumor (Anaya et al., 2020) and antifungal (Aziz et al., 2016) properties apart from its consumption as fresh, semi-processed and processed products (Queck et al., 2013). It is also considered to have rich amounts of potassium, magnesium, calcium, phosphorous (Hollerhage et al., 2015)

It is grown extensively in Latin American and South American countries (Sanusi et al., 2018). It is found both wild and cultivated throughout the West Indies and from Southern Mexico to Peru and Argentina up to an altitude of 1100 m MSL. It is grown mostly in tropical regions of the world and is distributed from South America to Australia, Asia and Africa (Mortan, 1987). In India, the exact detail of the introduction of this plant is not known. But it is considered that it was introduced along with other fruits of this family in the eighteenth and nineteenth centuries (Indriyani, 2011). Though soursop was introduced to India long back but it is grown in very limited scale in the plantations. Presently it is found growing in the tropical humid part of Karnataka, Tamil Nadu and Kerala (Pradheep et al., 2021).

Soursop is commonly propagated through seeds (Badrie and Schauss, 2010). The soursop seeds usually germinate 3-4 weeks after sowing and germination can be delayed to 2–3 months after sowing under suboptimal conditions (Joseph, 2014, Chavan et al., 2015, Mishra and Panda, 2017). Poor emergence of soursop seedlings is because of poor storability of the seeds (Okali et al., 2018). Pre-germination treatments were not representative methods of overcoming seed dormancy (Silva et al., 2017). However, the seeds have hard and thick seed coats which restrict the entry of moisture, thus delaying germination and resulting in uneven maturity as like in wood apple (Nonogaki, 2019, Sau et al., 2019). Soursop seeds are known to lose viability easily and as such do not store for a very long time and is, therefore, best planted without delay (Joseph, 2014).

Asexual techniques are the easy ways to overcome the problems of seed propagation (George and Nissen, 1987, Negi et al., 2015, Banyal et al., 2022). Rootstocks also plays a very important role in propagation of plant (Manjunatha et al., 2017 and Singh et al., 2019). Compatibility of rootstock and scion is of prime importance in the vegetative method of propagation (Kumar, 2020, Rasool et al., 2020). In addition to this, growing environment also plays a major role in order to create congenial conditions for obtaining better growth and development of propagated plants (Bhandari, 2021). Keeping this in mind, a study was under taken to know the effect of rootstock and environmental condition on success and survival of soursop plants propagated through patch budding.

## 2. MATERIALS AND METHODS

The present investigation was conducted in polyhouse, shade house (50% shade) condition and open condition (under the tree) at College of Horticulture, Mysuru, University of Horticultural Sciences, Bagalkot, Karnataka, India during the year 2020–2021 (January to June, 2021). The research site was located at the latitude and longitude of 12°18' North and 74°65' East respectively and at an altitude of 770 m above mean sea level. The experiment was laid out in Completely Randomized Design (CRD) with factorial concept. There were two factors having two levels (rootstocks: *Annona muricata* and *Annona squamosa*) in one and three levels (growing conditions: polyhouse, 50% shade net and open condition) in other. It comprises of 6 treatment combinations with five plants per replication which were replicated thrice (Table 1).

Table 1: Details of the treatment combinations related to study on patch budding

| Treatments | Combinations | |
|---|---|---|
| $T_1$ | $R_1E_1$ | *Annona muricata* rootstock budded under open field condition |
| $T_2$ | $R_1E_2$ | *Annona muricata* rootstock budded under 50% shade net condition |
| $T_3$ | $R_1E_3$ | *Annona muricata* rootstock budded under polyhouse condition |
| $T_4$ | $R_2E_1$ | *Annona squamosa* rootstock budded under open field condition |
| T5 | $R_2E_2$ | *Annona squamosa* rootstock budded under 50% shade net condition |
| T6 | $R_2E_3$ | *Annona squamosa* rootstock budded under polyhouse condition |

The soursop and sweetsop seedlings of local cultivar which were raised in black polythenebags of 200-gauge (8"×6" size) thickness were used as rootstock. The vigorously growing healthy rootstocks of 9 months old seedlings with uniform growth were selected for propagation. The average height of soursop and sweetsop was 52.3 cm and 53.7 cm respectively. The scion shoots for propagation were collected from the healthy mother plants of soursop present at the College of Horticulture, Mysuru. Since, soursop is an evergreen plant, precuring of healthy shoots were carried out in the month of January for the better sprouting of the propagated plants. After about 12 days precured shoots were ready for the use as scion material. Then those shoots were separated from the mother plant and were used immediately for performing patch budding. The budding operation was performed on selected rootstock seedlings of both soursop and sweetsop by using the patch of scion bud wood measuring 2.4×1.5 cm (length and width) with a healthy bud which was inserted to the cut portion (similar patch of bark as like scion was removed between the internodes of rootstock) of rootstock and was tied firmly with the polythene strip exposing bud outside. The observations were taken at monthly intervals upto four months after propagation.

Statistical analysis

The data obtained in present investigation was statistical analyzed by the method suggested by Panse and Sukhatme (1985).

## 3. RESULTS AND DISCUSSION

### *3.1. Days taken for sprouting, budding success percentage (45 DAB) and survivability percentage (120 DAB)*

The results depicted in Table 2 revealed that the early initiation of sprouting of buddling (34.96 days), highest percentage of success (91.60%) and survival percentage (85.30%) were recorded in *Annona muricata* rootstock. The delayed initiation (36.88 days), lowest success percentage (86.70%) and survival percentage (78.80 %) were noted in *Annona squamosa* rootstock. Early sprouting in *Annona muricata* might be due to rapid complete union of xylem and cambium tissue of the scion and rootstock favouring closer matching of the scion tissue to the rootstock stem helping in early differentiation of callus tissue and formation of new cambium tissue. Present findings are in consonance to the findings as recorded by Singh et al. (2012) in citrus and reported that growth performance of Nagpur mandarin scion budded on the Nagpur mandarin rootstock gave good success percentage (68.31 %) and early bud sprout (7.2 days) than on Rangpur lime and Rough lemon rootstocks.

The highest percentage of success and survivability could be due to quicker formation of callus at the budded portion resulting in the faster healing of bud union due to faster

Table 2: Number of days taken for sprouting, success percentage (45 DAB) and survivability percentage (120 DAB) of *Annona muricata* budlings as influenced by different rootstocks of Annona and environmental conditions

| Treatments | No. of days to sprout | Budding success percentage at 45 DAB | Budding survivability percentage at 120 DAB |
|---|---|---|---|
| Factor-1 Rootstocks | | | |
| $R_1$ | 34.96 | 91.60 | 85.30 |
| $R_2$ | 36.88 | 86.70 | 78.80 |
| SEm± | 0.24 | 2.10 | 2.20 |
| CD ($p$=0.05) | 0.72 | 6.50 | 6.70 |
| Factor-2 Environmental conditions | | | |
| $E_1$ | 36.74 | 85.40 | 79.50 |
| $E_2$ | 36.15 | 89.20 | 81.50 |
| $E_3$ | 34.87 | 92.90 | 85.20 |
| SEm± | 0.29 | 2.60 | 2.70 |
| CD ($p$=0.05) | 0.89 | 7.90 | 8.30 |
| Interaction effect | | | |
| $R_1E_1$ | 35.61 | 85.40 | 81.50 |
| $R_1E_2$ | 35.18 | 93.00 | 85.40 |
| $R_1E_3$ | 34.08 | 96.50 | 89.00 |
| $R_2E_1$ | 37.86 | 85.00 | 77.20 |
| $R_2E_2$ | 37.11 | 85.40 | 77.50 |
| $R_2E_3$ | 35.66 | 89.30 | 81.50 |
| SEm± | 0.42 | 3.70 | 3.90 |
| CD ($p$=0.05) | 1.26 | 11.20 | 11.70 |

$R_1$: *Annona muricata* $R_2$: *Annona squamosa*; $E_1$: Open condition; $E_2$: 50% Shade net; $E_3$: Poly house; DAB: Days after budding

developmental processes like cell division and cell elongation resulting in early emergence of leaves with more leaf area which might have led to the production of more quantum of carbohydrates required for the growth and development of budlings. This might have resulted in the higher success percentageand survivability percentage. The present findings are in line with the results obtained by Singh et al. (2012) in citrus and Manjunatha et al. (2017) in jack fruit wherein Tubagare jackfruit variety budded on KM-3 rootstock gave maximum success percentage (89.83 %). However, the minimum sprouting was recorded in *Annona squamosa* might be due to poor regeneration that suppress the activity of hydrolysing enzyme which favours inadequate mobilization of reserve food material.

Among different environmental conditions, the minimum number of days taken for sprouting (34.87 days), highest budding success percentage (92.90%) and survival percentage (85.20%) were recorded under polyhouse condition followed by 50% shade net condition (36.15 days), (89.20%) and (81.50%) respectively. The maximum days to

bud sprout (36.74 days), least success percentage (85.40%) and survivability percentage of budlings (79.50%) were recorded under open condition. It might be due to controlled environmental conditions prevailed in the polyhouse like no direct sunlight which prevents the drying and desiccation of buds, optimum temperature which enhances the scion - stock union formation and also optimum humidity which helps in early sprouting as compared to open field condition where there is direct sunlight and high temperature (Patel, 2016). These findings are in conformity with findings of Joshi et al. (2016) in guava and reported that polyhouse condition positively influenced the success rate and growth parameter under study and Syamal et al. (2013) in Bael and stated that polyhouse condition gave better response than open field condition with respect to number of days taken to bud sprout (6.66 days), sprouting percentage (85.50%) and survival percentage (91.25%).

Amidst interactions, $R_1E_3$ recorded minimum days to first sprouting (34.08 days), highest budding success percentage (96.50%) and survivability percentage (89.00%) followed by $R_1E_2$ (35.18 days), (93.00%) and (85.40%) respectively. The maximum days required for sprouting (37.86 days), lowest success percentage (85.00%) and lowest survivability percentage (77.20%) were recorded in $R_2E_1$.

### *3.2. Number of leaves, length and girth of sprouted shoot (30, 60, 90 and 120 DAB)*

It is evident from the data presented in Table 3 that there were significant differences in the number of leaves, length and diameter of sprouted shoots at 60, 90 and 120 days after budding. Since the sprouts were emerged after 30 days of budding, the data recorded for all the parameters mentioned above at 30 days after budding was zero. However, highest number of leaves (3.81, 6.56 and 13.67), length (3.58 cm, 8.19 cm and 15.42 cm) and girth of sprouted shoots (1.35 mm, 1.86 mm and 2.08 mm) were significantly increased

Table 3: Number of leaves, length and girth of sprouted shoot of Annona muricata budlings as influenced by different rootstocks of Annona and environmental conditions at 60, 90and 120 days after budding

| Treatments | No. of leaves buddling$^{-1}$ | | | Length of sprouted shoot (cm) | | | Girth of sprouted shoot (mm) | | |
|---|---|---|---|---|---|---|---|---|---|
| | 60 DAB | 90 DAB | 120 DAB | 60 DAB | 90 DAB | 120 DAB | 60 DAB | 90 DAB | 120 DAB |
| Factor-1 Rootstocks | | | | | | | | | |
| $R_1$ | 3.81 | 6.56 | 13.67 | 3.58 | 8.19 | 15.42 | 1.35 | 1.86 | 2.08 |
| $R_2$ | 2.63 | 5.00 | 11.63 | 2.89 | 6.14 | 12.15 | 0.91 | 1.19 | 1.49 |
| SEm± | 0.14 | 0.20 | 0.30 | 0.11 | 0.18 | 0.20 | 0.04 | 0.05 | 0.06 |
| CD ($p$=0.05) | 0.38 | 0.60 | 0.91 | 0.46 | 0.54 | 0.60 | 0.11 | 0.15 | 0.19 |
| Factor-2 Environmental conditions | | | | | | | | | |
| $E_1$ | 2.72 | 5.22 | 11.94 | 2.93 | 6.61 | 12.63 | 0.92 | 1.29 | 1.54 |
| $E_2$ | 3.27 | 5.72 | 12.50 | 3.20 | 6.96 | 13.61 | 1.16 | 1.53 | 1.81 |
| $E_3$ | 3.67 | 6.39 | 13.50 | 3.54 | 7.93 | 15.12 | 1.33 | 1.75 | 2.02 |
| SEm± | 0.19 | 0.24 | 0.37 | 0.17 | 0.22 | 0.24 | 0.05 | 0.06 | 0.08 |
| CD ($p$=0.05) | 0.48 | 0.74 | 1.11 | 0.56 | 0.66 | 0.73 | 0.14 | 0.18 | 0.23 |
| Interaction effect | | | | | | | | | |
| $R_1E_1$ | 3.11 | 6.00 | 12.78 | 3.08 | 7.71 | 14.12 | 1.13 | 1.58 | 1.84 |
| $R_1E_2$ | 3.89 | 6.44 | 13.33 | 3.46 | 7.98 | 15.43 | 1.32 | 1.87 | 2.03 |
| $R_1E_3$ | 4.44 | 7.22 | 14.89 | 4.18 | 8.89 | 16.71 | 1.60 | 2.13 | 2.36 |
| $R_2E_1$ | 2.33 | 4.44 | 11.11 | 2.78 | 5.51 | 11.13 | 0.70 | 1.01 | 1.24 |
| $R_2E_2$ | 2.67 | 5.00 | 11.67 | 2.95 | 5.94 | 11.79 | 0.99 | 1.20 | 1.56 |
| $R_2E_3$ | 2.89 | 5.56 | 12.11 | 2.91 | 6.97 | 13.53 | 1.06 | 1.37 | 1.82 |
| SEm± | 0.24 | 0.35 | 0.52 | 0.21 | 0.31 | 0.34 | 0.07 | 0.08 | 0.12 |
| CD ($p$=0.05) | 0.67 | 1.04 | 1.58 | 0.79 | 0.94 | 1.04 | 0.20 | 0.25 | 0.32 |

$R_1$: *Annona muricata* $R_2$: *Annona squamosa*; $E_1$: Open condition; $E_2$: 50% Shade net; $E_3$: Poly house; DAB: Days after budding with *Annona muricata* rootstock compared to *Annona squamosa* rootstock (2.63, 5.00 and 11.63), (2.89 cm, 6.14 cm and 12.15 cm) and (0.91 mm, 1.19 mm and 1.49 mm) respectively at 60, 90 and 120 days after budding. It may be due to better potency of soursop rootstock to absorb and translocate nutrients besides its better photosynthetic ability as appears deceptively from a greater number of leaves that influence the ongoing development process accounting to cell division, expansion and differentiation governing size, shape and structure of plants. The results obtained in the present investigation are in accordance with Manjunatha et al. (2017) in jack fruit wherein there exist significant variation among the different rootstocks of jack fruit with regard to number of leaves and girth of sprouted shoot and reported that maximum leaves per shoot (7) and diameter of shoot (5.54 mm) was obtained when Tubagare jackfruit was budded on KM-3 rootstock.

The maximum number of leaves (3.67, 6.39 and 13.50), length (3.54 cm, 7.93 cm and 15.12 cm) and girth of sprouted shoots (1.33 mm, 1.75 mm and 2.02 mm) were registered under polyhouse condition followed by 50% shade net condition (3.27, 5.72 and 12.50), (3.20 cm, 6.96 cm and 13.61 cm) and (1.16 mm, 1.53 mm and 1.81 mm) respectively whereas minimum was observed under open field condition for number leaves (2.72, 5.22 and 11.94), length of sprouted shoot (2.93 cm, 6.61 cm and 12.63 cm) and girth of sprouted shoot (0.92 mm, 1.29 mm and 1.54 mm) at 60, 90 and 120 days after budding respectively. This is because of congenial environment for shoot development and increased level of carbon dioxide coupled with good photosynthesis under polyhouse condition resulted in higher number of leaves, increased shoot length and girth. This outcome is in agreement with Dixit et al. (2019) and stated that, maximum shoot length and shoot diameter of the guava buddlings were noticed

in shade house condition (20.37 cm and 1.28 cm respectively) when compared to open field condition (18.50 cm and 1.21 cm respectively).

The interaction effect revealed that $R_1E_3$ recorded higher number of leaves (4.44, 7.22 and 14.89), length of sprouted shoot (4.18 cm, 8.89 cm and 16.71 cm) and girth of sprouted shoot (1.60 mm, 2.13 mm and 2.36 mm) which was followed by $R_1E_2$ (3.89, 6.44 and 13.33), (3.46 cm, 7.98 cm and 15.43 cm) and (1.32 mm, 1.87 mm and 2.03 mm). The minimum number of leaves (2.33, 4.44 and 11.11), length of sprouted shoot (2.78 cm, 5.51 cm and 11.13 cm) and shoot diameter (0.70 mm,1.01 mm and 1.24 mm) were registered under $R_2E_1$.

*3.3. Number of nodes and length of internode (30, 60, 90 and 120 DAB)*

It is obvious from the data presented in Table 4 that different rootstock had influenced significantly on number of nodes and length of internode. Since the sprouts were emerged after 30 days of budding, the data recorded for both the parameters mentioned above at 30 days after budding was zero.

Table 4: Number of nodes and length of internode (cm) of Annona muricata budlings as influenced by different rootstocks of *Annona* and environmental conditions at 60, 90 and 120 days after budding

| Treat-ments | Number of nodes | | | Length of internode (cm) | | |
|---|---|---|---|---|---|---|
| | 60 DAB | 90 DAB | 120 DAB | 60 DAB | 90 DAB | 120 DAB |
| Factor-1 Rootstocks | | | | | | |
| $R_1$ | 3.52 | 6.11 | 11.67 | 1.20 | 1.47 | 1.73 |
| $R_2$ | 2.40 | 4.81 | 10.56 | 0.93 | 1.10 | 1.46 |
| SEm± | 0.12 | 0.20 | 0.27 | 0.03 | 0.03 | 0.04 |
| CD ($p$=0.05) | 0.31 | 0.60 | 0.81 | 0.10 | 0.09 | 0.14 |
| Factor-2 Environmental conditions | | | | | | |
| $E_1$ | 2.61 | 5.11 | 10.72 | 0.93 | 1.14 | 1.48 |
| $E_2$ | 2.89 | 5.39 | 10.89 | 1.00 | 1.20 | 1.50 |
| $E_3$ | 3.39 | 5.89 | 11.72 | 1.25 | 1.51 | 1.81 |
| SEm± | 0.14 | 0.24 | 0.33 | 0.03 | 0.04 | 0.05 |
| CD ($p$=0.05) | 0.38 | 0.73 | 1.00 | 0.10 | 0.12 | 0.17 |
| Interaction effect | | | | | | |
| $R_1E_1$ | 3.11 | 5.89 | 11.22 | 1.02 | 1.27 | 1.53 |
| $R_1E_2$ | 3.44 | 6.11 | 11.44 | 1.04 | 1.29 | 1.57 |
| $R_1E_3$ | 4.00 | 6.33 | 12.33 | 1.52 | 1.84 | 2.09 |
| $R_2E_1$ | 2.11 | 4.33 | 10.22 | 0.84 | 1.01 | 1.42 |
| $R_2E_2$ | 2.33 | 4.67 | 10.33 | 0.96 | 1.12 | 1.43 |
| $R_2E_3$ | 2.78 | 5.44 | 11.11 | 0.98 | 1.18 | 1.52 |
| SEm± | 0.19 | 0.34 | 0.47 | 0.05 | 0.06 | 0.08 |
| CD ($p$=0.05) | 0.53 | 1.03 | 1.41 | 0.15 | 0.17 | 0.24 |

$R_1$: *Annona muricata* $R_2$: *Annona squamosa*; $E_1$: Open condition; $E_2$: 50% Shade net; $E_3$: Poly house; DAB: Days after budding

Maximum number of nodes (3.52, 6.11and 11.67) and internodal length (1.20 cm, 1.47 cm and 1.73 cm) were observed with *Annona muricata* rootstock whereas, minimum number of nodes (2.40, 4.81 and 10.56) and internodal length (0.93 cm, 1.10 cm and 1.46 cm) were registered with *Annona squamosa* rootstock at 60, 90 and 120 days after budding respectively. The growth stimulations might be due to the endogenous gibberellin levels which led to increase in cell division and cell enlargement. This could be attributed to vigorous growth of stock that led to better movement of translocates which in turn increase the nodes number and internodal length. Present findings are in consonance to the finding as recorded by Manjunatha et al. (2017) who confirmed that there exist variation in respect of different rootstocks used for budding.

Different growing conditions under investigation influenced significantly on number of nodes and length of internode. Highest number of nodes (3.39, 5.89 and 11.72) and internodal length (1.25 cm, 1.51 cm and 1.81 cm) were recorded in the budlings under polyhouse condition which was followed by 50% shade net condition (2.89, 5.39 and 10.89) and (1.00 cm, 1.20 cm and 1.50 cm) respectively. The minimum record with respect to number of nodes (2.61, 5.11 and 10.72) and internodal length (0.93 cm, 1.14 cm and 1.48 cm) were observed from budlings kept under open field condition at 60, 90 and 120 days after budding respectively. This is because of congenial environment for shoot development and increased level of carbon dioxide under polyhouse condition resulted in higher number of nodes and internodal length. The present findings are in agreement with the results obtained by Joshi et al. (2016) in guava which exhibited significant variation with respect to number of nodes and internodal length as affected by various rootstocks, growing condition and their interaction. Polyhouse condition positively influenced the success rate and growth parameter under study.

Under the interaction effect, maximum number of nodes (4.00, 6.33 and 12.33) and internodal length (1.52 cm, 1.84 cm and 2.09 cm) were recorded in treatment combination $R_1E_3$ which was followed by $R_1E_2$ (3.44, 6.11 and 11.44) and (1.04 cm, 1.29 cm and 1.57 cm) respectively. The minimum number of nodes (2.11, 4.33 and 10.22) and internodal length (0.84 cm, 1.01 cm and 1.42 cm) were registered under treatment combination $R_2E_1$ at 60, 90 and 120 days after budding respectively.

## 4. CONCLUSION

There was significant variations with respect to number of days taken to bud sprout, successpercentage, survival percentage and growth parameters viz., number of leaves, shoot length, shoot girth, number of nodes and internodal length due to different rootstock species and environmental conditions on patch budding of soursop plants. Hence, soursop when budded on its own rootstock and kept under polyhouse condition gives best result in patch budding method of propagation.

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