## BIBLIOGRAPHY

LAOYAN, JOLAFLOR C. MAY 2012. Acclimatization of Carnation (*Dianthus caryophyllus* var. Prodo Mint) Plantlets from *in vitro*. Benguet State University, La Trinidad, Benguet.

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## ABSTRACT

The study was conducted at the Ornamental Horticulture Area, Benguet State University, La Trinidad, Benguet, from February 2012 to April 2012. The study was conducted to establish the most appropriate growing media to harden rooted carnation plantlets and to establish a protocol for the acclimatization of rooted carnation plantlets grown from *in vitro* before transplanting them to the greenhouse benches.

Results shows that carnation plantlets grown in alnus compost + burnt rice hull 1:1 were the best growing media that promoted the production of longer roots, higher number of developed leaves, and promoted faster plant growth. Likewise, plantlets grown in sandy loam soil + burnt rice hull 1:1 produced higher number of roots. However, the different soil media compositions did not significantly affect the percentage survival of the acclimatized mint green carnation plantlets.

Soil media composition of alnus compost + burnt 1:1 or carbonized rice hull is recommended for the acclimatization of carnation plantlets from *in vitro* for best performance of the plantlets prior to *in vivo* transplanting in the greenhouse.

## RESULTS AND DISCUSSION

### Root Length

Highly significant differences were observed among the different growing media used. A mixture of alnus compost + burnt rice hull 1:1 promoted the longest roots with a mean of 7.53 cm. Plantlets grown in sandy loam soil + sand 1:1 had the shortest length of roots with a mean of 2.15 cm

According to Thompson and Troech (1978), the use of compost resulted in humus formation and promotes good soil structure. Compost also supplies nutrients such as nitrogen, phosphorus, calcium, magnesium and organic matter of 5.6 %.

On the other hand, Dumaslan (2006) stated that the presence of sand and burnt rice hull in the alnus compost media improved the physical properties of the medium resulting to better drainage and aeration leading to better plant growth and performance in strawberry plantlets.

Table 1. Root length per plantlet after 45 days from transplanting

| TREATMENT | MEAN (cm) |
|---|---|
| Alnus Compost + Sandy Loam Soil (1:1) | 3.18[c] |
| Alnus Compost + Sand (1:1) | 3.02[c] |
| Alnus Compost + Burnt Rice Hull (1:1) | 7.53[a] |
| Sandy Loam Soil + sand (1:1) | 2.15[c] |
| Sandy Loam Soil + Burnt Rice Hull (1:1) | 5.48[b] |
| Burnt rice Hull + sand (1:1) | 6.51[ab] |

Means followed by a common letter are not significantly different at 5% level (DMRT).

Number of Leaves

Results showed that plantlets grown in the different media had significantly different number of leaves per plantlet after 45 days from transplanting. Plantlets grown in alnus compost + burnt rice hull 1:1 produced the most number of leaves with a mean of 38.67 followed by those grown in burnt rice hull + sand 1:1 with a mean of 34.00, respectively.

Thompson and Troech (1978) added that the use of compost resulted in humus formation and promoted good soil structure. Compost also supplies nutrients such as nitrogen, phosphorus, calcium, magnesium and organic matter of 5.6 %.

Length of Leaves

Plantlets grown in alnus compost + burnt rice hull 1:1 significantly produced longer leaves but were not significantly different to the length of leaves of plantlet grown in sandy loam soil + burnt rice hull 1:1 and in burnt rice hull + sand 1:1.

Table 2. Number of leaves per plantlet after 45 days from transplanting

| TREATMENT | MEAN |
|---|---|
| Alnus Compost + Sandy Loam Soil (1:1) | 19.33[b] |
| Alnus Compost + Sand (1:1) | 16.00[b] |
| Alnus Compost + Burnt Rice Hull (1:1) | 38.67[a] |
| Sandy Loam Soil + sand (1:1) | 12.00[b] |
| Sandy Loam Soil + Burnt Rice Hull (1:1) | 31.00[a] |
| Burnt rice Hull + sand (1:1) | 34.00[a] |

Means followed by a common letter are not significantly different at 5% level (DMRT).

Table 3. Length of leaves per plantlet after 45 days from transplanting

| TREATMENT | MEAN (cm) |
|---|---|
| Alnus Compost + Sandy Loam Soil (1:1) | 1.51[b] |
| Alnus Compost + Sand (1:1) | 1.41[b] |
| Alnus Compost + Burnt Rice Hull (1:1) | 3.78[a] |
| Sandy Loam Soil + sand (1:1) | 1.07[b] |
| Sandy Loam Soil + Burnt Rice Hull (1:1) | 3.71[a] |
| Burnt rice Hull + sand (1:1) | 3.33[a] |

Means followed by a common letter are not significantly different at 5% level (DMRT).

Plantlets grown in sandy loam + sand 1:1 produced the shortest leaves with a mean of 1.07 cm.

Plant Height

Table 4 shows that there were highly significant differences observed on the height of plantlets grown in different soil media combinations. The prodo mint carnation plantlets grown in alnus compost + burnt rice hull 1:1 were the tallest among the treatments with a mean of 3.15 cm, followed by plantlets grown in burnt rice hull + river sand 1:1, sandy loam + burnt rice hull 1:1 with means of 2.83 cm and 2.28 cm, respectively. It was also observed that plantlets acclimatized in sandy loam soil + sand 1:1 have the shortest height with a mean of 1.45 cm and was comparable with plantlets grown in alnus compost + sand 1:1 with means of 1.51 cm and 1.63 cm, respectively.

Macli-ing (2012) found that a media of alnus compost +sand + burnt rice hull 1:1:1 promoted faster plant growth for the acclimatization of chrysanthemum plantlets.

Table 4. Plant height per plantlet after 45 days from transplanting

| TREATMENT | MEAN (cm) |
|---|---|
| Alnus Compost + Sandy Loam Soil (1:1) | 1.51[c] |
| Alnus Compost + Sand (1:1) | 1.63[c] |
| Alnus Compost + Burnt Rice Hull (1:1) | 3.15[a] |
| Sandy Loam Soil + sand (1:1) | 1.45[c] |
| Sandy Loam Soil + Burnt Rice Hull (1:1) | 2.28[b] |
| Burnt rice Hull + sand (1:1) | 2.83[ab] |

Means followed by a common letter are not significantly different at 5% level (DMRT).

Number of Roots

Based on the results presented in Table 5, sandy loam soil + burnt rice hull 1:1 enhanced the production of more roots, followed by soil media composition: alnus compost + burnt rice hull 1:1, burnt rice hull + sand 1:1, and alnus compost + sandy loam soil 1:1 with means of 24.55, 23.33, 13.00 and 11.00 roots per plantlet, respectively, while, plantlets grown in alnus compost + sand 1:1 had the lowest number of roots per plantlet after 45 days from transplanting with means of 9.11 roots per plantlet.

In the handbook of Texas Greenhouse Management, burnt rice hull have a light weight but effective in improving drainage while sand do little to improve the physical properties of growing media that may result in reduced drainage and aeration as a result of compaction as cited by Dumaslan (2006).

Table 5. Number of roots per plantlet after 45 days from transplanting

| TREATMENT | MEAN |
|---|---|
| Alnus Compost + Sandy Loam Soil (1:1) | 13.00[bc] |
| Alnus Compost + Sand (1:1) | 9.11[c] |
| Alnus Compost + Burnt Rice Hull (1:1) | 24.55[ab] |
| Sandy Loam Soil + sand (1:1) | 11.00[bc] |
| Sandy Loam Soil + Burnt Rice Hull (1:1) | 32.45[a] |
| Burnt rice Hull + sand (1:1) | 23.33[abc] |

Means followed by a common letter are not significantly different at 5% level (DMRT).

Percentage Survival

Based on the results in Table 6, there were no significant effects of the different growing media on the percentage survival of the prodo mint carnation plantlets. However, it was observed that plantlets grown on alnus compost + sandy 1:1, alnus compost+ burnt rice hull 1:1 and burnt rice hull + sand 1:1 have 100 percent survival, while those that were grown in sandy loam soil+ burnt rice hull 1:1 and sandy loam soil + sand 1:1 have 88.89 percent plant survival. Among the treatments, plantlets grown in alnus compost + sandy loam soil 1:1 had the least number of established plants.

Table 6. Percentage survival

| TREATMENT | MEAN (%) |
|---|---|
| Alnus Compost + Sandy Loam Soil (1:1) | 77.78 |
| Alnus Compost + Sand (1:1) | 100.00 |
| Alnus Compost + Burnt Rice Hull (1:1) | 100.00 |
| Sandy Loam Soil + sand (1:1) | 88.89 |
| Sandy Loam Soil + Burnt Rice Hull (1:1) | 88.89 |
| Burnt rice Hull + sand (1:1) | 100.00 |

Means followed by a common letter are not significantly different at 5% level (DMRT)

Occurrence of Insect Pests and Diseases

Insect occurrence was observed during the study. Results show that 50% of the total plantlets grown in sandy loam soil + sand 1:1 were infested by cabbage butterfly as compared to the other growing media however disease occurrence was not observed during the study.

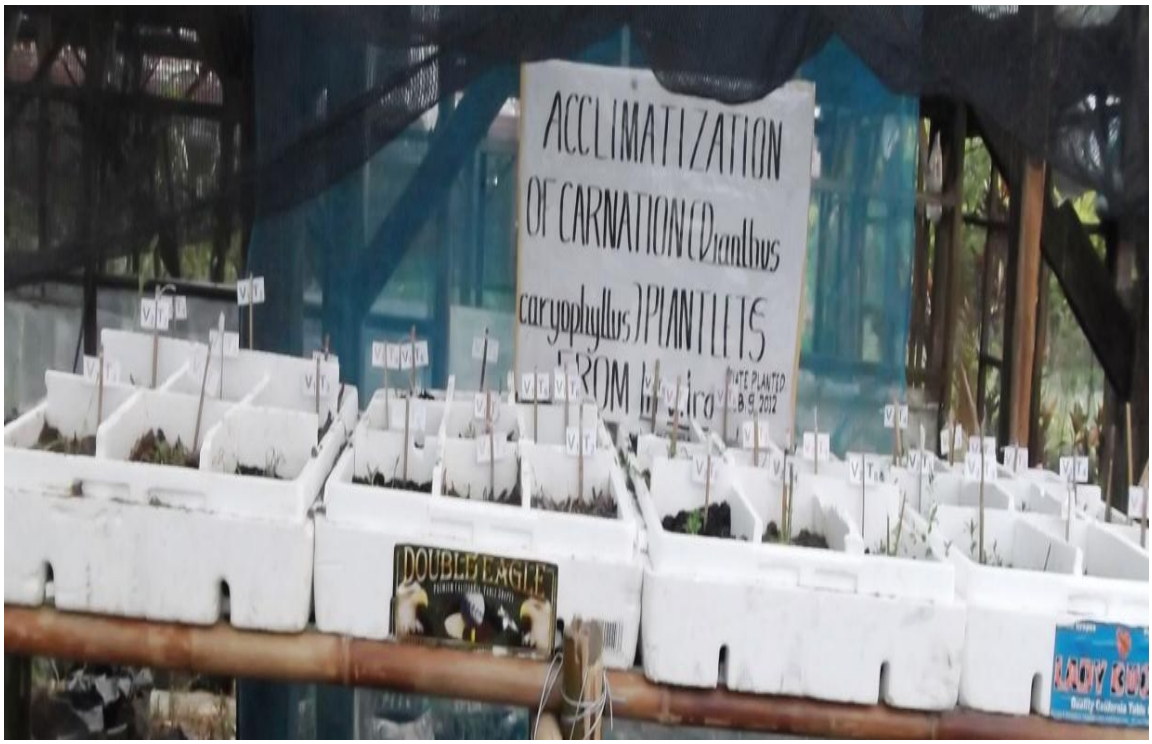


Figure1. Overview of the experimental area

Figure 2. Carnation plantlets from culture bottles before transplanting in the different growing or acclimatization media

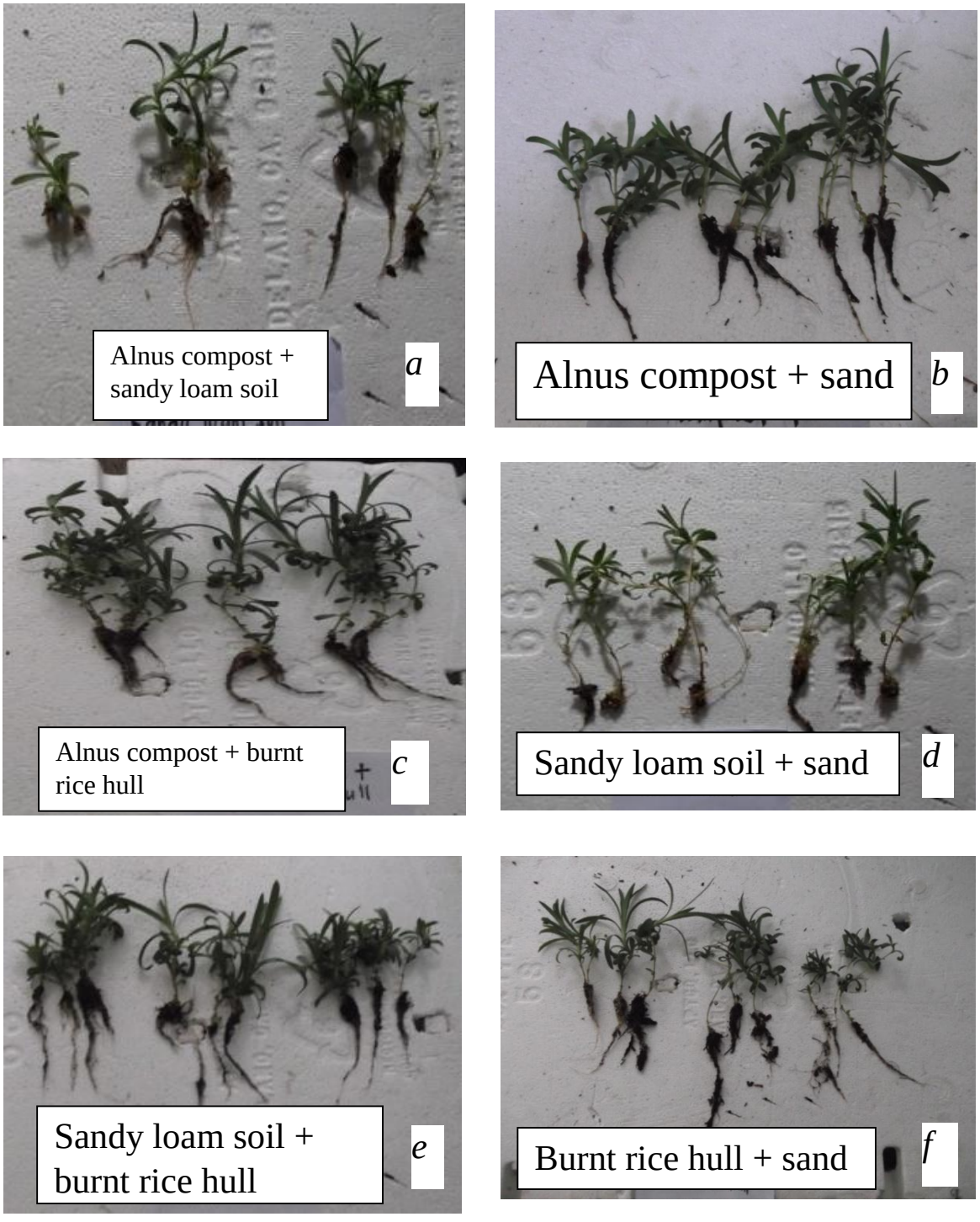


Figure 3. Plantletys grown in 1:1 a) alnus compost + sandy loam soil; b) alnus compost sand; c) alnus compost + burnt rice hull; d) sandy loam soil + sand; e) sandy loam soil + burnt rice hull; and f) burnt rice hull + sand 45 days after transplanting.

# SUMMARY, CONCLUSION AND RECOMMENDATIONS

## Summary

The study was conducted to determine the most appropriate soil media to harden rooted carnation and to establish a protocol for the acclimatization of rooted carnation from *in vitro*.

Soil media composition of alnus compost + burnt rice hull 1:1 significantly promoted faster plant growth, longer root length, produced more leaves and longer length of leaves. Moreover, plantlets grown in sandy loan soil + burnt rice hull 1:1 produced more number of roots. However the different soil media compositions have no significant effects on the percentage survival of plantlets grown from *in vitro*.

## Conclusion

Based on the results of the study the use of alnus compost + burnt rice hull 1:1 media composition promoted the best root and growth performance of acclimatized carnation plantlets.

## Recommendations

From the preceding results, acclimatizing carnation plantlets is recommended to be done on alnus compost + burnt rice hull 1:1 for best plantlets root and shoot establishment. The following protocol is recommended in acclimatization of carnation plantlets from *in vitro*:

1. To harden the tissue cultured plantlets, the bottled carnation plantlets will be first exposed to partial shade conditions and ambient temperature;

2. After one week, the plantlets will be removed from the bottle and washed with

tap water to remove the gelling agent;

3. The plantlets will be soaked in Previcur fungicide (2ml/L) for five minutes then transplanted into alnus compost + burnt rice hull 1:1 growing media;

4. Before planting, the alnus compost + burnt rice hull 1:1 will be drenched with Previcur fungicide solution (2ml/L) to avoid unnecessary infection. The plantlets will be planted under partial shade and will be misted once a day to prevent excessive drying; and,

5. The plantlets will be maintained for 45 days before transplanting in the greenhouse benches.

Recommended Acclimatization Protocol of Carnation Plantlets

*Bottled carnation plantlets from in vitro*

*Removed plantlet from the bottle*

*Washing of the agar medium from the roots*

*Plantlets are soaked in fungicide solution for 5 minutes*


*Preparation: 1:1 alnus compost + burned rice hull*

*Drenching of the soil media with fungicide solution*

*Transplanting of the plantlets in the sterilize soil media*

*Successfully acclimatized plantlets 60 days after transplanting*

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