# COLLECTION AND GROWTH RESPONSES OF *BAECKEA FRUTESCENCE* WILDINGS AFTER 12 MONTHS PLANTED AT FRIM'S SUBSTATION IN MARAN, PAHANG

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**ABSTRACT**

*Baeckea frutescens is heather-like shrub under the family of Mrytaceae. In Malaysia, it referred as cucur atap. Most of this tree can be found along sandy area of Peninsular Malaysia, Sumatra and the Coastal areas of Southern China and Australia. This species are familiar as natural remedy to be used in curing various health conditions and claimed to have potential anti-bacterial, anti-dysentry, anti-pyretic and diuretic activities. In addition, it is believed to be effective in treating influenza, coryza, epistaxism sunstroke, fever, headache, measles, colic, jaundice, and irregular menstrual cycles. Due to this benefits and potential in pharmaceutical aspect, researchers from Forest Research Institute Malaysia (FRIM) has considered to collect and conserve this species as a germplasm collection. Thus, several attempts have been taken to conduct it which was started by collecting wildings from four selected populations (Sungai Baging, Setiu, Nilai, and Cameron Highland), maintaining the plants at a nursery stage, establishing a germplasm and finally evaluating the plant growth. Prior to that, the growth response of B. frutescens wildings after 12 months planted at FRIM's Substation in Maran, Pahang were observed. The output of this study will be used for future references and guideline for the planters that are interested to plant this species.*

Key words: Cucur atap, collection, germplasm, performance, guideline

## INTRODUCTION

*Baeckea frutescens is* a shrub heather-like shrub or a small evergreen tree under the family of Mrytaceae. In Malaysia, this native species is referred as cucur atap (MyBIS). This tree is 1-6 m tall with trunk up to 10 cm of diameter with greyish brown, vertically fissured bark and tending to flake. The leaves are opposite form and needle-like, seemingly in clusters at condensed nodes. The flowers are too small and the reproduction is bisexual. It can be reproduced by seed but the germination times takes about 12 months for the seedlings to fully develop. Whereas, other propagation methods such as cuttings also did not describe by any review.

In Malaysia, *B. frutescens* can be found on mountain tops, quartz ridge, and sandy coast of the eastern parts of Peninsular and are distributed along the coastal areas of Southern China and Australia (Kochummen, 1978; Wong et al., 2010). This species is familiar as natural remedy to be used in curing various health conditions. Traditional medicinal properties of this species were reported in influenza, dyspepsia, jaundice, dysentery, measles, and irregular menstrual cycles (Adib et al, 2014). The bioactive constituents were shown to have potential anti-bacterial, anti-dysentry, anti-pyretic and diuretic activities (Shahruzaman et al, 2019). However, recent study from Shahruzaman et al. (2019) showed this species can be utilised as an effective agent that regulates metabolic reprogramming in breast cancer. This study used branches extracts from *B. frutescens* and the results showed potent selective cytotoxic activity against MCF-7 cells compared to MDA-MB-231 cells after 72 hours of treatment by inhibiting glucose consumption in breast cancer cells.

Besides that, *B. frutescens* also has a potential to be used as anti-gout remedies. Research conducted by Fadzureena et al. (2013) showed that active compound in the leaves and stems of *B. frutescens* extract are effective in inhibiting uric acid formation and promoting uric acid secretion. Thus, effective against gout attack prevention.

Based on the potential of the species and due to the narrow distribution and difficulty to find this species, researchers from Forest Research Institute Malaysia (FRIM) has taken an initiative to collect and conserve this species as a germplasm collection. To our knowledge, there are no information was found on the procedure of wildings collection, germplasm establishment as well as on the growth performance. Previous study from others was mainly focussed on the technique on how to convert the species to a bonsai tree. Therefore, this study was conducted with the objective to evaluate the growth response of *B. frutescens* wildings after 12 months planted at a germplasm plot located in FRIM's Substation in Maran, Pahang. This paper also highlights the process of collection, propagation and the process of establishment of germplasm plot.

## MATERIALS AND METHODS

### WILDING COLLECTION OF *BAECKEA FRUTESCENCE* FROM DIFFERENT POPULATIONS

A total of four populations were identified and coded differently as CCA (Sg Baging, Pahang), NCA (Nilai, Negeri Sembilan), TCA (Setiu, Terengganu) and CCH (Cameron Highland, Pahang) for easier identification. From each population, 30 phenotypically superior trees showing good growth, full of branches, superior height, and bole diameter were selected for the study (Figure 1). Collection of wildings with an average of 1.5 feet height were conducted surrounding the mother trees. The plants were pulled out carefully using small shovel. Root ball were made for each wildings to avoid any root damage. After that, all plants were transported back to FRIM for further treatment. The topographic information such as coordinates, altitudes (Table 1) , dates of assessment and morphological data were also recorded.

Figure 1: *Baeckea frutescens* mother plants with good phenotypic characteristics


Table 1: Topographic information of *Baeckea frutescens* collected from four populations

| Populations | Code | GPS Points | Altitude |
|---|---|---|---|
| Sg Baging | CCA | N4 04.000 E103 23.003 | 40 m |
| Nilai | NCA | N2 48.659 E101 46.393 | 102 m |
| Setiu | TCA | N5 30.949 E102 58.076 | 20 m |
| Cameron highland | CH | N4 04.168 E103 23.051 | 80 m |

### GROWING AND PLANT MAINTENANCE AT NURSERY

The collected wildings of *B. frutescens* were potted into polybags with the size of 6" x 8". In order to know the best and suitable growing media for this *B. frutescens* wildings, five types of growing media were prepared for potting these wildings. Selection of the growing media are based on the common practices at nursery. There are; Media 1 (1 top soil: 2 sand), Media 2 (1 top soil: 2 compost: 1 sand), Media 3 (1 top soil: 2 coconut husk: 1 sand), Media 4 (1 top soil: 1 coconut husk) and Media 5 as control (100% sands). The tested experiment was conducted at FRIM's Nursery. Wildings of *B. frustescens* were laid out in Randomized Complete Block Design (RCBD) with five treatments and three replications. All potted plants were placed and well maintained at FRIM's nursery. They were treated uniformly in terms of irrigation system, watering frequency and shade percentage (50%). The survivality, height and diameter of the wildings were recorded over a period of 6 months.

From this experiment, mixture of soil that give the high survivality to the wildings will be used for growing *B. frutescens* wildings. The plants were acclimatized at FRIM's nursery with 50% shade for three months. After that, they were transferred to the open area for two months in order to go through the process of hardening. The plants were well maintained where watering, weeding, fertilization were conducted regularly.

### ESTABLISHMENT OF *BAECKEA FRUTESCENCE* GERMPLASM

FRIM's Substation in Maran, Pahang was selected as a location for the establishment of germplasm plot. The site was selected due to its suitable soil condition which is categorized as clay loam. At the initial phase of establishment, the selected area was cleared and ploughed to further improve the soil condition. Planting distance used was 1.0 m x 1.0 m. A total of 120 wildings of *B. frutescens* from four populations were planted. The plot was covered with 50% shade netting and irrigated with sprinkler system. The planting plots were also covered with silver shine plastics for weed control. The germplasm plot will be used as sources of production of quality planting materials in the future by evaluating their growth and chemical markers.

Figure 2: The planting design of Baeckea frutescence germplasm at Maran, Pahang

| | | |
|---|---|---|
| CCA10 CCA11 CCA30 | TCA10 TCA11 TCA30 | NCA10 NCA11 NCA30 | CH10 CH11 CH30 |
| CCA9 CCA12 CCA29 | TCA9 TCA12 TCA29 | NCA9 NCA12 NCA29 | CH9 CH12 CH29 |
| CCA8 CCA13 CCA28 | TCA8 TCA13 TCA28 | NCA8 NCA13 NCA28 | CH8 CH13 CH28 |
| CCA7 CCA14 CCA27 | TCA7 TCA14 TCA27 | NCA7 NCA14 NCA27 | CH7 CH14 CH27 |
| CCA6 CCA15 CCA26 | TCA6 TCA15 TCA26 | NCA6 NCA15 NCA26 | CH6 CH15 CH26 |
| CCA5 CCA16 CCA25 | TCA5 TCA16 TCA25 | NCA5 NCA16 NCA25 | CH5 CH16 CH25 |
| CCA4 CCA17 CCA24 | TCA4 TCA17 TCA24 | NCA4 NCA17 NCA24 | CH4 CH17 CH24 |
| CCA3 CCA18 CCA23 | TCA3 TCA18 TCA23 | NCA3 NCA18 NCA23 | CH3 CH18 CH23 |
| CCA2 CCA19 CCA22 | TCA2 TCA19 TCA22 | NCA2 NCA19 NCA22 | CH2 CH19 CH22 |
| CCA1 CCA20 CCA21 | TCA1 TCA20 TCA21 | NCA1 NCA20 NCA21 | CH1 CH20 CH21 |

## DATA COLLECTION

Morphological data of the wildings such as height (cm) and diameter (mm) were collected continuously from months one until months 12. The differences of each growth characteristics after 12 months planting were analyzed using Analysis of variance (ANOVA), Minitab version 17. Then, Duncan's Multiple Range Test was run to see whether there is significantly difference between these four populations.

## RESULTS AND DISCUSSIONS

### GROWING MEDIA OF *BAECKEA FRUTESCENCE* AT NURSERY STAGE

Study showed wilding of *B. frustescens* performed better in Media 1 (1 top soil: 2 sand) compared to other types of growing media (Table 2). Even though the survival percentages are below than 90%, however it still showed good growth response with the average percentage of 67%. The height of wildings in Media 1 also showed significantly difference (16.2 cm) compared to other Media (M2-M4). In terms of collar diameter, Media 1 also showed the highest value (1.27 mm) compared to wildings from other media.

Meanwhile, medium containing combination of compost and coconut husk showed only 26 to 41% of survivality rate. Sawdust and coconut husk are found to have high capacity in holding moisture and may contribute to low air porosity. Under this condition, the plants do not receive sufficient air and oxygen for respiration during the rooting process (Frenck & Kim, 1995). Whereas, Media 5 (control) indicated the lowest survivality rate. In terms of height and collar diameter, the results revealed that there are no significantly difference between Media 2, 3, 4 and 5.

Other than that, the survivality of the plants may be influenced by the factor of soil structure itself and pH value. For example, medium with sand only has tendency to drain the water quickly as the pores between the particles is large compared with the medium sand that mixed up with top soil. The structure is better in supporting the root penetration and absorption of enough water for the plant growth (Hartmann & Kester, 1983).

Table 2: Survival and wilding growth of *B. frustescens* using five different of growing media

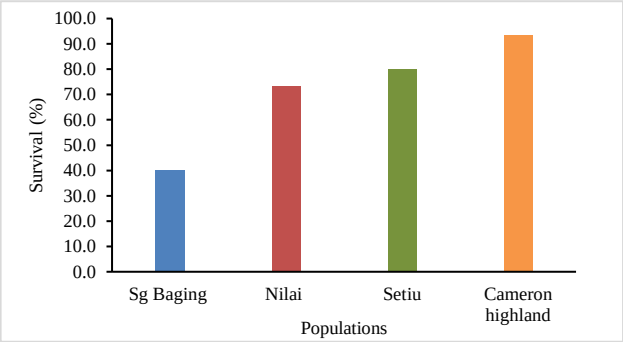
| Treatments | Survival (%) | Height (cm) | Diameter (mm) |
|---|---|---|---|
| M1: 1 top soil: 2 sand | 67.3a | 16.2a | 1.27a |
| M2: 1 top soil: 2 compost: 1 sand | 41.3b | 5.53b | 0.49b |
| M3: 1 top soil: 2 coconut husk: 1 sand | 37.8bc | 3.97b | 0.30b |
| M4: 1 top soil: 1 coconut husk | 25.7bc | 6.9b | 0.58b |
| M5: 100% sands | 17.0c | 2.8b | 0.32b |

Means followed by the same letter as not significant at 0.05 significance level.

### GROWTH RESPONSE OF *BAECKEA FRUTESCENCE* AFTER 12 MONTHS PLANTED

Survival rate of *B. frutescence* wildings after 12 planted in a germplasm at Maran, Pahang recorded some variations. It was found that *B. frutescence* wildings from Cameron Highland, Pahang recorded the highest survival rate (93.3%), followed by Setiu, Terengganu (80.0 %) and Nilai, N. Semnbilan (73.3%). However, wildings from Sg. Baging, Pahang gave the lowest survival rate which was only 40% (Figure 2).

Figure 3: Survival rate of *Baeckea frutescence* wildings from four populations after 12 months planted at Maran, Pahang




Based on the results of analysis of variance (ANOVA) as shown in Table 2, the value for height of *B. frutescence* wildings increased from 30 cm after 12 months planted in field. It was found that all wildings from four populations achieved the height of more than 50 cm. The maximum height of *B. frutescence* wildings was recorded by population of Setiu, Terengganu with 70.13 cm, followed by wildings from population of Cameron highland, Pahang (67.29 cm) and Sg. Baging, Pahang (63.67 cm). Whereas, for stem diameter (mm), all wildings of *B. frutescence* recorded significantly different but indicated not much variation. The stem diameter ranging from 2 to 4 mm.

According to the Goran et al. (1998), there are some reasons why wildings have better performance in the field. Most of the wildings have gone through a natural selection and hardening. Wildings also has been experienced considerable stress when removed from their original site and it gave hardened to them. Other than that, wildings have a better root if compared to the seedlings and have a better developed mychorrhizal association when planted in the soil. Otherwise, the procedure in handling the wildings before and after collection should be given attention. The common nursery practices such as shaded, watering, fertilization, and growing medium also need to be emphasized.

Table 2: Growth of Baeckea frutescnece wildings after 12 months planted at Maran, Pahang

| **Populations** | **Height (cm)** | **Diameter stem (mm)** |
|---|---|---|
| Sg Baging | 63.67ab ± 5.66 | 3.96a ± 1.36 |
| Nilai | 56.23b ± 4.98 | 2.78ab ± 0.31 |
| Setiu | 70.13a ± 4.66 | 3.71ab ± 0.30 |
| Cameron highland | 67.29ab ± 2.20 | 2.32b ± 0.11 |

Means followed by same letter is not significant at 0.05 level of significance.

## CONCLUSION

As a conclusion, based on the early findings, wildings of *B. frutescence* have to be maintained in a good growing media during nursery stage as well as their watering, weeding, fertilization were regularly maintained. Wildings from population Setiu, Terengganu and Cameron Highlands, Pahang have great potential as sources for production of high quantity and quality of planting materials in future breeding programme due to better growth responses. However, further investigation on presence of reference marker for each of the individual wildings should be carried out in order to identify the superior genotype in the future. Besides, it is hope that this germplasm can be one of the centre that secure the supply of high-quality raw materials to meet the demands from herbal industry in making pharmaceutical products.

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