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**RESEARCH ARTICLE**

# The effect of Buddhist *pirith* chanting and Western pop music on growth performance of "Pranajeewa", *Codariocalyx motorius* (Houtt.) H. Ohashi

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**Abstract:** Response of *Codariocalyx motorius* to Western pop music and *Pirith* chanting was examined by conducting an experiment with three months old *C. motorius* saplings, kept in a sound proof confined chamber. Completely Randomized Design (CRD) was used with five replicates. One week after planting, plants were exposed to three treatments; Western pop music, *Pirith* and silence. Music and *Pirith* were played separately for an hour, 30 cm distance away from plants with a sound level of 58 – 63 dB for two months continuously, maintaining equal environmental conditions. Measurements on growth performance were taken once in a fortnight. Percentage difference of parameters was calculated and data were analysed using ANOVA. Significant differences ($p < 0.05$) between the treatment of *Pirith* and Western pop music were observed for plant height, leaf width, leaf area, and chlorophyll content and leaflet length. However,thin layer chromatographic profiles observed under UV light and Anisaldehyde spray reagent exhibited no difference in chemical components. Magnitudes of the percentage difference between measured parameters of *C. motorius* under *Pirith* chanting and Western pop music indicated that there was discernible effect of *Pirith* chanting on the measured plant parameters in the study implying that rhythmic chanting of *Pirith* is the most appropriate type of music which improved the growth performance of *C. motorius*.

***Keywords:*** *Codariocalyx motorius, Pirith* Chanting, Western pop music, 'Pranajeewa', TLC.

## INTRODUCTION

Music is a form of art which uses variety of instruments and vocals to bring out profound sounds and tones. It is an aesthetic language which represents cultures, tribes and societies all around the world. The common elements of music are pitch, rhythm, dynamics, and sonic qualities of timbre and texture (Hevner, 1935). The combination of these elements can bring down different effects on living organisms including plants. The experiments on the effect of sound and music on plants was begun in early 1955 by the pioneers of sound experiments on plants eg: Singh and Ponniah. In their experiment they played incomprehensible violin pieces intermittently to plants at certain times of the day and observed responses of plants to sounds. However, the results obtained from these experiments are unclear and limited details are available on their study (Collins and Foreman, 2001). Weinberger and Measures (1969) carried out a research on sound for spring wheat [Marquis] and winter wheat [Rideau]. They have found that the growth and germination were profoundly higher compared to the control they used (Measures and Weinberger, 1969). Research on sound and music took a new pathway as a Dorthy Retallack (1968), focused on studying effects of different music genres in western music including classical, jazz, pop, rock, acid rock, East Indian, and country. In her experiment she found out that harsh music such as rock and acid rock have negative effect on plant while classical, jazz and Indian were in good physical shape for plant growth (O'Donnell, 1999). However, there is a lack of documented information on the effect of religious sermons on plant growth.

Plants are known to possess different stimuli mechanism in their physiology. Sound stimuli, although limited detailed information available was known to be one of them. *Codariocalyx motorius* (or *Desmodium gyrans*) also known as the 'dancing' plant, telegraph plant, semaphore or 'Pranajeewa', belonging to the family Fabaceae is one of the remarkable plants of existence. C. *motorius* is a deciduous tree often used as medicine in Eastern medicine. It has been used to treat various diseases such as rheumatism, cough, malaria, pyrexia, dysentery, hepatitis, haemoptysis, etc. (Chidambaram *et al*., 2013). It is also used as a home remedy for cuts and bruises. Interestingly, this plant is known to be containing a range of alkaloids including N,N-dimethyltryptamine and 5-methoxy-N,N-dimethyltryptamine which can be used as production of pharmaceuticals (Ileperuma, 2015). It is also an attractive ornamental plant which can be grown in home gardens. The specialty of this plant species is rhythmic movements of the lateral leaflets to physical stimuli (music/sound). These movements are due to rhythmic swelling and shrinking of motor cells located in the pulvinus of the leaf system. Although, the exact mechanism has not being clearly explained, it is believe that these movement occur due to the uptake and release of large number $K^+$ and $Cl^-$ (Sharma *et al*., 2001). An extensive amount of K+ also shuttles from one part of the pulvinus to the other, acting as a cation reservoir. Hence, the depolarization of the membranes of the motor cells causes $K^+$ and $H^+$ efflux and that their hyper polarization causes $K^+$ and $H^+$ influx into the cells.

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These $K^+$ fluxes were believed to be accountable for the movement of water transversely the pulvinus, which results in volume changes in the pulvinus causing visible leaflet movement (Ileperuma, 2015).

Although, there is lack of documented evidence to confirm the influence of music on the growth and behaviour of *Codariocalyx motorius*, studies have conducted to distinguish the vigilant results for different stimuli for plants (Chowdhury and Gupta, 1999*)*. Therefore, the objective of the study is to distinguish the behaviour and the growth of *Codariocalyx motorius* to different sound and music treatments.

## MATERIALS AND METHODS

Three months old *C. motorius* saplings were used for the experiment. The experiments were carried out in a sound proof confined chamber in the Botany Research Laboratory at the Open University of Sri Lanka, Nawala.The saplings were planted in plastic pot filled with a mixture of compost and soil, up to ¾ of the total depth and arranged in Completely Randomized Design (CRD) with five replicates. One week after planting, the experiment was initiated. Plants were subjected to three experimental conditions, exposing to western pop music, *Pirith* and silence separately in sound proof chambers. A set of pop songs belongs to genres in pop music such as pop-rock, pop-punk, dance-pop and psychedelic-pop and *Thunsuthra (Karaneyameththasuthra, Rathanasuthra, Mahamangalasuthra)* were chosen for music and the *pirith* respectively. Plant grown under silence served as control. Music and *Pirith* were played separately for an hour, 30cm distance away from the plants with a sound level of 58 – 63 dB for two (02) months continuously, maintaining equal environmental conditions (Vanol and Vaidya, 2014). Measurement of plant height (cm), number of leaflets, number of leaves, and number of branches, leaf area ($cm^2$), leaf width (cm), leaf length (cm)and chlorophyll contentper each plant were taken in fortnight. Mean monthly values and percentage difference between *Pirith* and control, and western pop music and control was calculated and tabulated for data analysis. The percentage difference of a particular parameter was calculated according to following equation. For the music treatment,

Percentage difference ($X_{Dif}$) $= [(X_{Teatment} - X_{Control})/X_{Control}] \times 100,$

Where $X_{Dif}$ is percentage difference of particular parameter with reference to control plant, $X_{Treatment}$ is value of the parameter under *Pirith* chanting and western pop music conditions. Percentage difference of the parameters was calculated and data were analysed using ANOVA in SPSS PC (Ver.23) (2015).

Leaves and stem parts where motor cells were located, were taken as the sample for chemical analysis. Leaves and stem parts were dried completely in 50 °C for two weeks until a constant weight was obtained. The plant parts were coarsely powdered and 5 g of the powder were extracted separately with 20 ml of methanol. The extract was concentrated at 45 °C using rotovapour (BuchiRotavapour, Type-R-114A29 B-480, Switzerland). Extraction was repeated for three (03) times using the same sample.Thin layer chromatographic analysis of plant extracts were performed according to the method described by Stahl, 1969 with slight modifications. Pre-coated Silica gel 60 GF254 plates were used and approximately 6µL of each sample was spotted on the TLC plate, air-dried and placed in the chromatographic chamber previously saturated with the solvent system (100% Dichloromethane). Developed TLC plates were observed under UV 366 nm and after spraying with anisaldehyde followed by heating at 105 °C for 3-5 minutes.

## RESULTS AND DISCUSSION

Means of plant height, leaf area, leaf width, leaf length, number of leaflets, and chlorophyll content were shown in Table 01. According to the table, the variables such as plant height,leaf length, and leaflet length and leaf area significantlydiffer from the plants grown under the western pop music. Meanwhile, the control plants and the plant grown under the western pop music showed significant difference in leaf length, leaf width and leaf area. Comparatively, the measured parameters of C. *motorius* plants grown under the *Pirith* chanting were higher and *Pirith* chanting in which increasing effect of growth parameters was observed.

Further, results indicate that difference between the plant height, leaf length, leaf width and leaf areaof plants grown under pirith and western pop music ($p<0.05$) (Table 1). However, the variation of leaf chlorophyll content between the plant grown under the western pop music and *pirith* chantings were statitically insignificant ($p > 0.05$). These results suggest that *pirith* chantings influcence the plant height, leaf length leaf width and leaf area.

**Table 1:** Summary statistics of the parameters measures across different treatments. Similar letters in column indicated that there is no statistically significant difference at p =0.05.

| Treatment | Plant height (cm) | Chlorophyll content /plant | Leaf length (cm) | Leaf width (cm) | Leaflet length (cm) | Leaf area ($cm^2$) |
|---|---|---|---|---|---|---|
| Control | 30.13 (1.29)$^a$ | 28.66(0.34)$^a$ | 5.30(0.29)$^a$ | 1.35(0.06)$^a$ | 1.56(0.05)$^a$ | 10.82(0.53)$^a$ |
| Western pop music | 31.50(1.48)$^a$ | 29.55(0.57)$^a$ | 5.64(0.23)$^b$ | 1.46(0.06)$^b$ | 1.50(0.05)$^a$ | 11.76(0.55)$^b$ |
| Pirith | 41.00(1.22)$^b$ | 30.45(0.61)$^a$ | 5.76(0.32)$^c$ | 1.69(0.07)$^c$ | 1.71(0.04)$^b$ | 12.90(0.46)$^c$ |

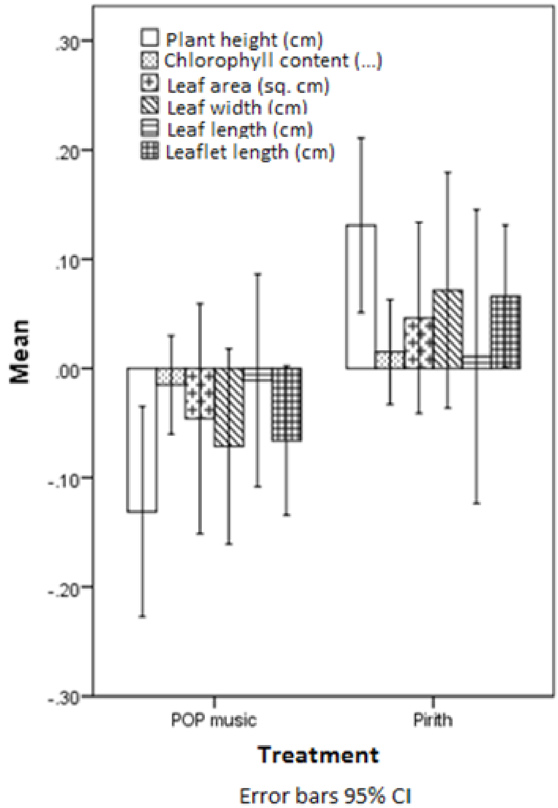



**Figure 1:** The percentage difference of the parameters compared to the control plant.

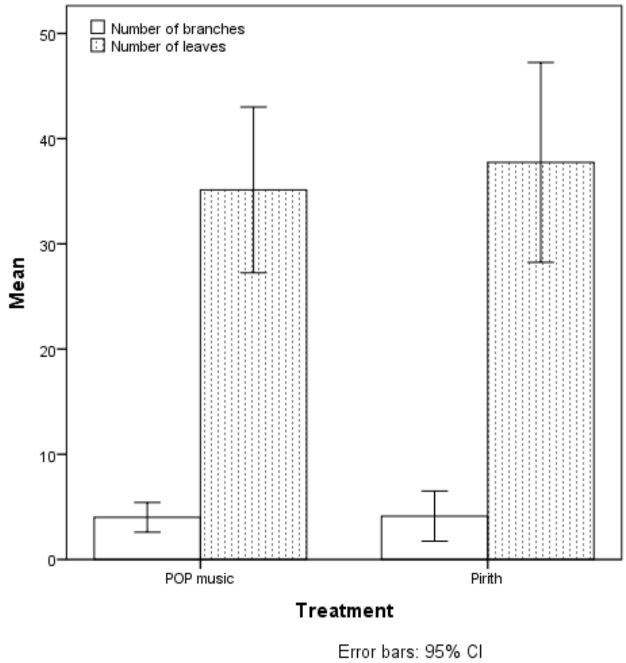



**Figure 2:** Variation of number of branches and number of leaves under different treatments. Chi square test values for number of plants and number of leaves were 8.8 and 9.33 and the associated p values were 0.183 and 0.591 respectively.

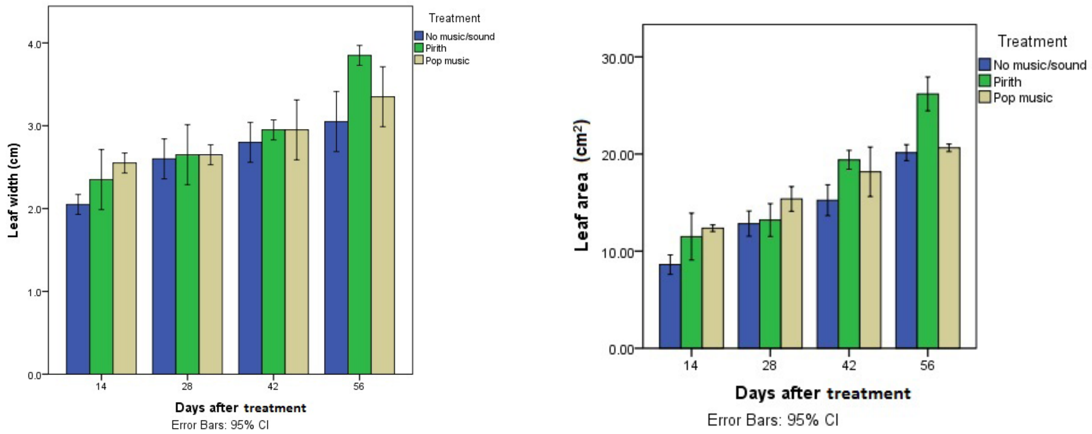
The magnitudes of the percentage difference between measured parameters of *C. motorius* under *Pirith* chanting and western pop music indicated that there was discernible effect of *Pirith* chanting on the measured plant parameters in the study (Figure 1). The variation of non-parametric measuaments such as number of branches and number of leaves is shown in Figure 2. Though varaiton is statistically not significant, the comparision of counts indicate that variation of the number of branches is nelegiable. However, number of leaves were comparatively high in plants treated with *pirith* chantings.

The comparison of leaf width and leaf area of the plants subjected to different treatment at varying time intervals is shown in Figure 3. The effect of the time duration of the treatments indicated an increasing trend which is more prominent at 56$^{th}$ day of the treatment. This relationship suggests that acclimatization of plant required a considerable time duration to response the stimulus.

The number of branches and number of leaves indicated an increasing trend in *C. motorius* between 14$^{th}$ and 56$^{th}$ days with maximum number of branches and number of leaves at 56$^{th}$ day of the experiment.

Thin layer chromatographic profiles observed under UV 366 nm and anesaldehyde spray reagent exhibited comparatively similar numbers of spots in methanolic extracts for two (02) plant parts in all treatment conditions. All the extracts exhibited a prominent samon pink spot (Rf = 0.52) under UV 366 nm. In addition, violet color spots (Rf = 0.42 and 0.48) and magenta color spots (Rf = 0.56, 0.59) were observed when sprayed with anisaldegyde.

Studies have found that soft rhythm of music and sounds causes plants to grow better (Chowdhury and Gupta, 1999*)*. In this experiment plants have experienced soft sounds through *Pali* words and pronunciation in *Pirith* chanting. Though there is no significant difference for number of leaves in plants exposed to *Pirith*, a significant difference was observed for number of leaflets and chlorophyll content which is in agreement of the hypothesis put forward by Chowdhury and Gupta (1999). In this hypothesis the increment of growth rate of plant was attributed toincreases the production of proteins when appropriate musical phrases accompanied by either vocals or orchestral music or both are played.Thus, the metabolism of the plant is increased. Though number of leaves is not significant, the hospitable environment for the production




(a) (b)

**Figure 3:** Variation of leaf width and leaf area under different sound treatments with time on (a) leaf width and (b) leaf area.

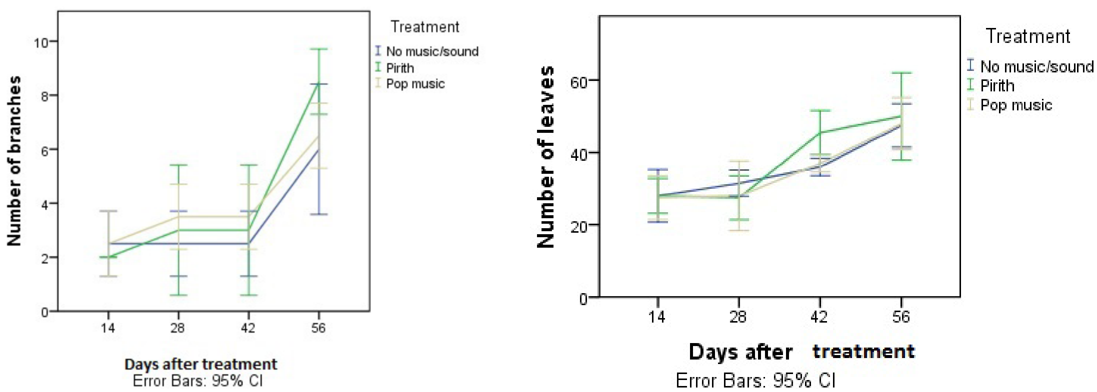



**Figure 4:** Effect of sound treatments on (a) number of branches and (b) number of leaves.

of more chlorophylls and leaflets would have facilitated through *Pirith* chanting rather than western pop music, thus *Pirith* chanting becoming the appropriate musical phrase accompanied by vocals. The same results were obtained by Collins and Foreman (2001) for the increment of plant height and leaves of Bean species. However, there are no details available on effect of *Pirith* and sermon chanting for plants including *Codariocalyx motorius*.

## CONCLUSION

The results of the present study revealed that subjecting *Codoriocalyx motorius* plants to Buddhist pirith chants promotes the growth performance. Further studies are needed to elucidate the mode involved in enhancing the growth performance of *C. matorius* in response to *Pirith* chanting.

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