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# Effect Of Music On Growth & Physiology Of Selected Plants

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**Abstract**

This study is an attempt to understand the effect of music on plant growth and behavior. Eight medicinal and ornamental plants were subjected to two different types of music rhythmic and soft-melodious music. The control set of plants were not exposed to any particular music. The music was played using normal speakers for three hours, each day. The parameters such as difference in height of the plant, number of leaves, flowering time, number of flowers, estimation of metabolites (protein, starch, phenols, reducing and non-reducing sugars and chlorophyll) were all monitored. The results showed that when plants were exposed to music, their growth speeded up and also there was increase in concentration of metabolites as compared to control plants.

Keywords: Plant growth, Soft-melodious music, plant height, metabolites

## Introduction

Music is an art form that not only is a powerful medium of communication but also has a positive impact on living beings well being. The researches in this area are underway to assess the influence of music on growth, development and metabolic processes in plants. Music is of four types-Positive music can be relaxing, calming, and mentally invigorating. Positive music is not about lyrics, but about the music itself. On the other hand, Negative music is a music that expresses or stimulates negative emotions like anger, frustration, depression, hatred and fear. Rhythmic music is a kind of music which has the rhythms like classical, violin, instrumental etc. Non-rhythmic music does not have the rhythms like rock music, pop, country, jazz etc.

Music is a vibratory phenomenon. Air particles are set in motion and these air particles in

turn set matter that is within hearing distance into motion. This is called vibration sympathy: When the vibrations of sound affect the airwaves, the airwaves affect other matter that they come into contact with in a manner that is in sympathy with the originating source. There are two main properties of a regular vibration - the amplitude and the frequency - which affect the way it sounds. Amplitude is the size of the vibration, and this determines how loud the sound is. Frequency is the speed of the vibration, and this determines the pitch of the sound. It is only useful or meaningful for musical sounds, where there is a strongly regular waveform (Tompkins and Bird, 1989).

A property of living things is that they respond to stimuli. Music effects human behavior in many ways and can summon emotions. It reduces fatigue, increases muscular endurance, speeds up voluntary activities, and it can manipulate the electrical conductivity in the human body.

Plants are complex multicellular organisms considered as sensitive as humans for initial assaying of effects and testing new therapies. Sound is known to affect the growth of plants and plants respond to music the same as humans do (Benford, 2002; Dossey, 2001; Kristen, 1997).

Music actually consists of sound waves that travel through the air at varying frequencies and finally reaching our ear drums to be recognized as sound and music. When the plant is exposed to the same music, it also receives the same sound waves and could in fact be receiving some form of stimuli.

Music causes drastic changes in plants metabolism. Plants enjoy music, and they respond to the different types of music and its wave-length. Music containing hardcore vibrations could be devastating to plants (Weinberger and Graefe, 1973).

Little work has been done in this field wherein the plants have been subjected to different types of sound and the effects being monitored and analyzed. On the basis of literature review the present study was an attempt to test the effect of music on plants in terms of plant growth, development and metabolism. Eight medicinal and ornamental plants selected for the experiments are as follows:

1. Tagetes erecta L.
2. Catharanthus roseus L.
3. Trachyspermum ammi L.
4. Duranta repens L.
5. Hibiscus rosa-sinensis L.
6. Epipremnum aureum L.
7. Dendranthema grandiflorm L.
8. Ocimum sanctum L.

**Materials and Methods**

Selected Plants and Experimental Design

Eight plants were selected and collected from the 'Van Chetna Kendra' Nursery, Gandhinagar. These plants were grown in the pots in Botanical garden of Department of Botany, Gujarat University, Ahmedabad. To investigate the effect of music on plants, two sets were prepared for the experiment. One set of selected eight plants was exposed to the music and other set of same eight plants was kept as control which was not exposed to any music.

**Music Type and Frequency**

The music which was selected for the treatment of plants was a kind of soft music.There were twelve soft songs selected with the average frequency of 100Hz.

**Source Of Music**

Music was applied by the normal speakers which were attached to the mobile phone. Distance between the speakers and the pots were about 35cm.

**Duration Of Music**

Plants are treated with music for the 1 month of duration, in which music was applied for3 hours daily to the plants.

**Environmental Conditions**

Equal amount of water was poured in each set of pots with an interval of every two days. The plants were placed in a botanical cage under normal environmental conditions like light, temperature and humidity.

**Date And Season Of Grown Plant**

Plants were grown in pots in December 2013 and the music treatment was given from for about two months.

**Collection Of Data**

Data was collected on the first day, and then at an interval of 15 days for two months.

Basically the whole experiment was divided into three main parts:

1. Effect of music on growth parameters of plants.
2. Phytochemical screening.
3. Estimation of various metabolites.

**Parameters Studied**

To study the effect of music on plant growth, several parameters studied are:

1. Height of the plant
2. Number of leaves
3. Flowering time
4. Number of flowers
5. Phytochemical screening
6. Estimation of metabolites( Protein, Phenols, Starch, Total sugar and reducing sugar, Chlorophyll)

**Phytochemical Analysis**

Preparation of Extract:

The fresh plants were collected and washed separately under running tab water for removing soil and dust particles. Plant material was air dried for two days and then powdered in a mixer grinder. Then this powder was soaked in (10gm/100ml) of solvent (methanol) overnight. The material was filtered and the extracts were pooled and evaporated to get the concentrated extract.

The qualitative preliminary phytochemical analysis of the extracts of all plant part isolated from methanol solvent was performed by following standard methods given by Harborne.

**Estimation Of Metabolites**

Standard methods were followed for estimation of metabolites

(a) Total Sugars and reducing sugar by Nelson, 1944

(b) Starch by Chinoy, 1939

(c) Total proteins by Bradford, 1976

(d) Total phenols by Bray et al., 1954

(e) Total Chlorophyll by Arnon, 1973

**Result and Discussion**

The result of this experiment is divided into three parts:

1. Effects of Music on plant growth
2. Phytochemical Screening
3. Biochemical analysis

Effect Of Music On Plant Growth

Sound is known to affect the growth of plants. Here the height increased (Fig. 1), the number of leaves also increased (Fig. 2) , the number of flowers also increased (Fig . 3).The flowering time was advanced so the plants showed early flowering (Table 1).

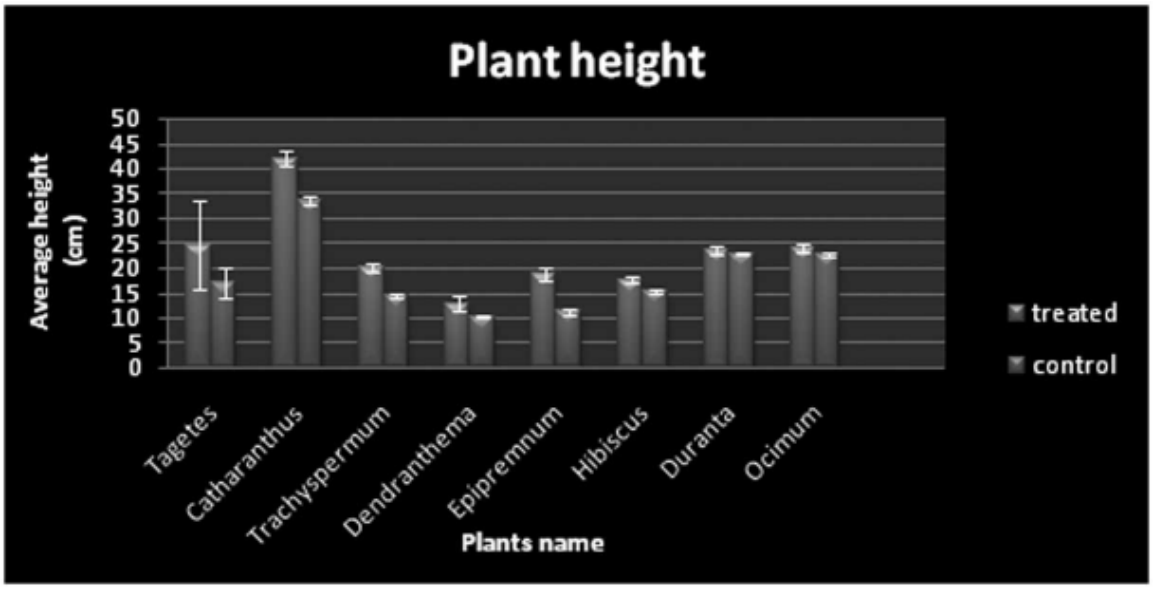


Fig. 1: Showing the height of Treated and Control plants

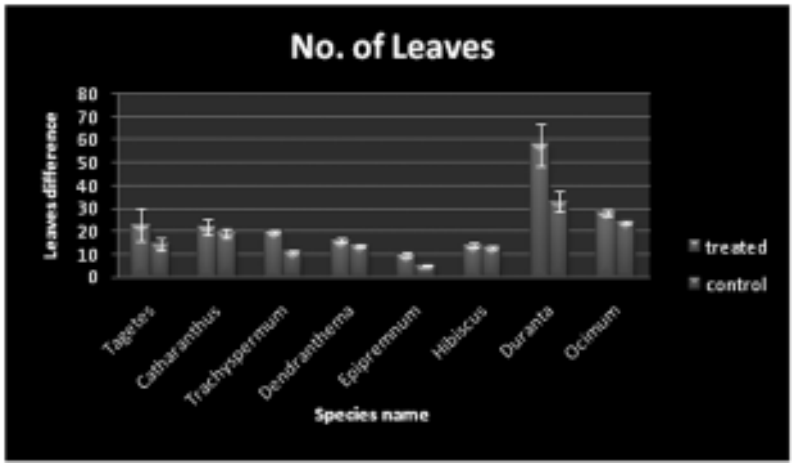


Fig. 2: Showing the Number of leaves of Treated and Control plants

Table 1. Showing Flowering time of Treated and Control plants

| S.NO | SET NAME | PLANTS NAME | DAY OF OCCURENCE OF BUD | DAY OF OCCURENCE OF FLOWER |
|---|---|---|---|---|
| 1. | TREATED (With music) | *Tagetes erecta* L. | 19th day | 25th day |
| 2. | | *Catharanthus roseus* L. | 25th day | 28th day |
| 3.. | | *Dendranthema grandiflorm* | 21st day | 29th day |
| 4. | | *Hibiscus rosa-sinensis L.* | No bud | No flower |
| 1. | CONTROL (Without music) | *Tagetes erecta* L. | 21st day | 29th day |
| 2. | | *Catharanthus roseus* L. | 26th day | 30th day |
| 3. | | *Dendranthema grandiflorm* | 30th day | No flower |
| 4. | | *Hibiscus rosa-sinensis L.* | No bud | No flower |

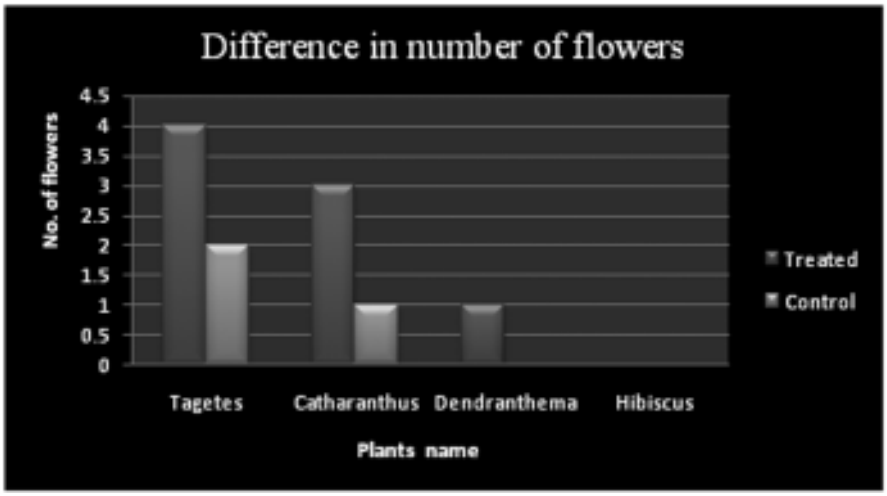


Fig 3: Number of flowers of Treated and Control plants

**Phytochemical Screening**

The extracts were subjected to preliminary phytochemical qualitative screening for the presence or absence of various primary or secondary metabolites.

Hence, several metabolites like Total sugar (Fig 4), Reducing sugar (Fig 5), Phenols (Fig 6), Starch (Fig 7), Protein (Fig 8),Chlorophyll (Fig 9) were found to be more in plants treated with music as against the control plants that were not exposed to music.

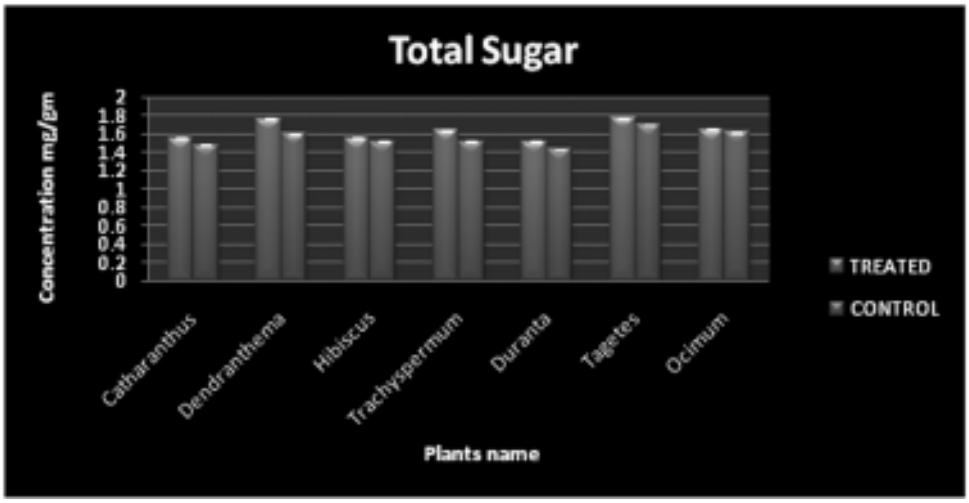


Fig 4: Comparison of total sugar between Treated and Control.

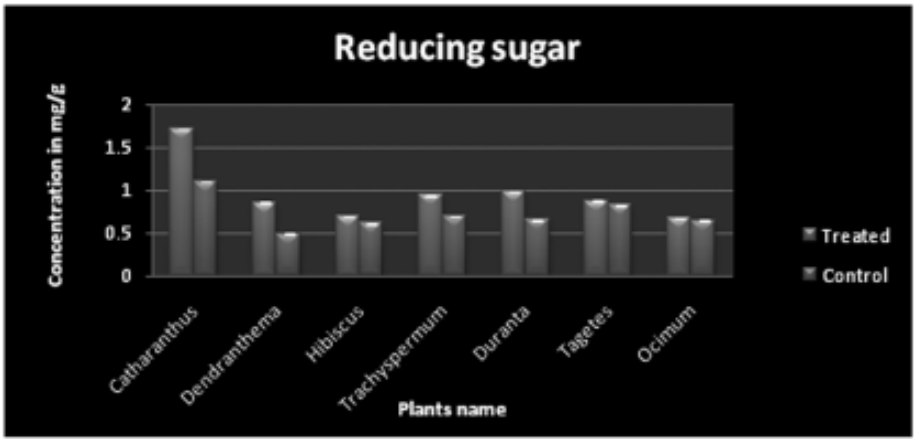


Fig 5: Comparison of reducing sugar between Treated and Control.

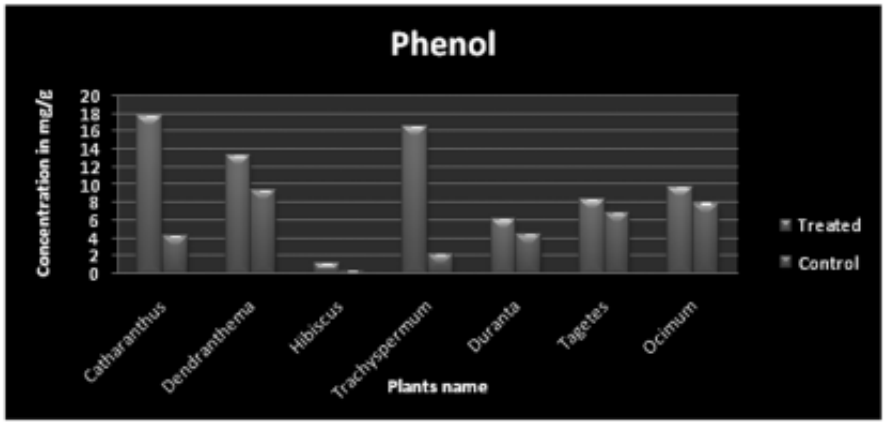


Fig 6: Comparison of Phenols between Treated and Control

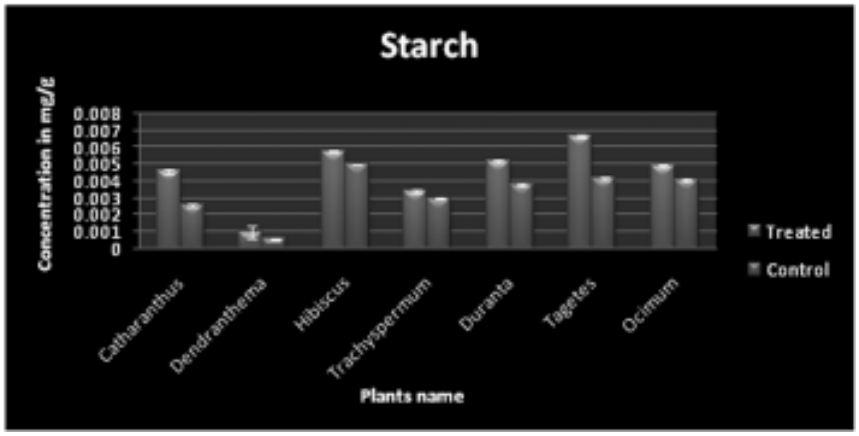


Fig 7 : Comparison of starch between Treated and Control

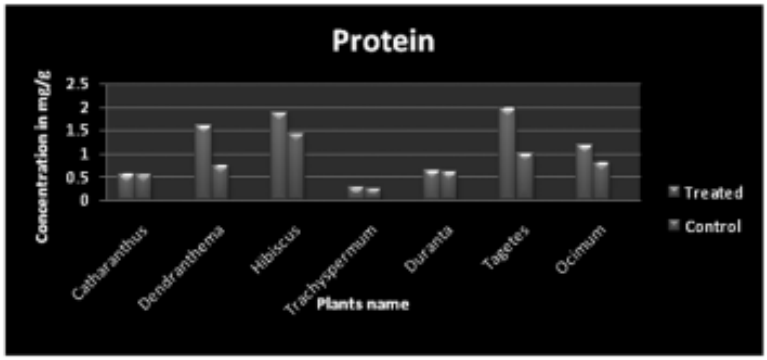


Fig 8: Comparison of protein between Treated and Control.

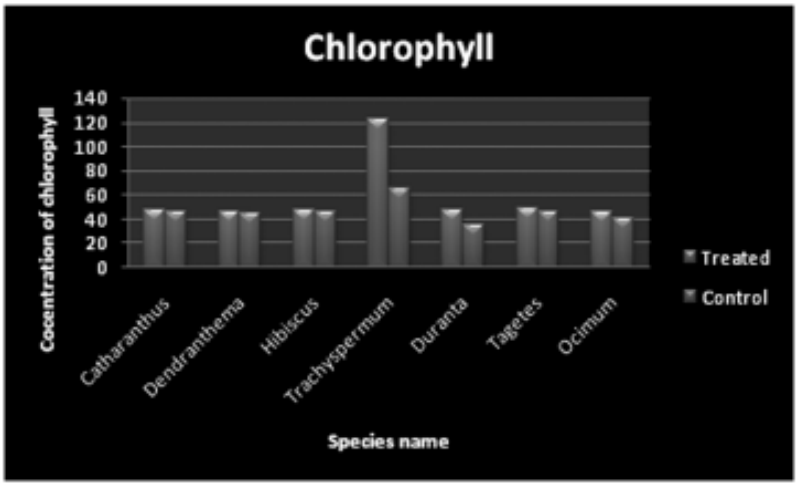


Fig 9 : Graphical representation of total chlorophyll

**Discussion**

Music, more than entertainment, has played an instrumental role in healing and harmonizing the mind, body and spirit. For thousands of years, the Vedic, China, India, Turkey and Greece culture has used sound and music for body and mind balancing, health enhancement, and encouragement of heightened awareness (Bailey-Lloyd, 2003-2004). According to Burbank, 1868; and Creath and Schwartz, 2004, Science is now showing that these sounds actually do influence the growth of plants. This experiment also shows that plants respond to sounds in pro-found ways which not only influence their overall health but also increase the speed of growth and the size of the plants.

According to Chatterjee et al, 2013, if plants are exposed to the music, then the height of the plant would increase and they become more and much healthier. In this experiment the height of the plants increased in treated plants. Music therapy also increases the number of leaves and the number of flowers as compared to the plants which are not treated with music.Singh, 1962 showed that the flowers appeared one week earlier in treated set than the control one and that holds true for this experiment also.

Plants actually pick up the sound vibrations which have the different frequency and generally plants respond best to frequency of 100Hz. As the basic science says that sound needs a medium to travel so in this case air is the medium for travel of musical sounds from source to the plants. In a similar manner, the pressure from a sound wave creates vibration that is picked by plants. Plant does not hear the music but feels the vibrations. According to Dan Carlson, if the frequency of the sound is between 100Hz to 500Hz, then it causes stomata of the plants to open and absorbs nutrients more efficiently.

The protoplasm-the living matter is in the form of translucent substance, is always in a state of perpetual movement. The vibration picked up by the plant will speed up this protoplasmic movement in the cells. This stimulation will then affect the system and may improve on its performance such as the manufacture of the more nutrients that will give a stronger and better plant.Music is actually influencing the plant growth and in a similar manner, it affecting the plants biochemically also. In this experiment, phytochemical screening shows the increase of various metabolites like sugars, Phenols, starch, amino acids, protein and carbohydrates. According to Mynn et al, 2009 chlorophyll is the most important green pigment of the plants. Music increases the amount of chlorophyll and starch content in the plants. Hence, the photosynthetic rate also increases which help the plants to grow better, on the other hand, starch is the product of the photosynthesis so if rate of photosynthesis increases then amount of starch also increases. This will result in an increase in the amount of energy which is used by the plants cell for various functions. Due to this plant height and number of leaves increases.

Music therapy also helps in increasing the amount of total sugar and reducing sugars in the plants. This will maintain the growth of the plant and thus control the plant metabolism. On playing music to the plants also increases the amount of concentration of protein and phenols. Proteins are the basic instruments for expression of the genetic information as it controls the genetic expressions. Even phenols have been found to be stimulatory for flowering, bud formation and nitrate assimilation.

So, if music really affecting the plant growth then this concept can be very beneficial for the future aspects. Farmers can utilize the concept of music therapy to yield a higher and better quality of crops. In nursery also, music can be applied to speed up the seed germination and make the plants healthier. Even in home also music helps in indoor plants growth.

## Conclusions

When melodious music therapy is applied to the plants, then plants shows positive results. There was a positive change in the plant growth. Plants grow faster when exposed to the music. Our preliminary studies clearly indicate that the plant is able to differentiate between “some sound” and “no sound”. For plants, melodious music was proving to be beneficial.Music also greatly influences the concentration of various metabolites. Hence this concept can be very useful in the field of Biochemistry, Horticulture, Physiology and ecology. Music can be used in plant nurseries to speed-up seed germination and help us grow healthier plants.

It can be concluded that plants grow faster with exposure to melodious music. This knowledge can be applied in agriculture to increase the yield and may help to solve the problem of starvation and world hunger in the future.

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