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Time Evolution of chlorophyll content in *Ocimum Tenuiflorum*

R. Jayakrishnan[1] and Tiju Joseph Mathew[2]
[1,2]*Department of Physics, Christian College, Chengannur, Kerala-689122, India.*

Abstract
Ocimum Tenuiflorum locally known as "Tulsi" is a widely used indigenous remedy to several ailments in our households. We have studied the evolution of chlorophyll content in the leafs of this plant over time in a day. We observe that the chlorophyll content reaches it maximum during noon time. This suggests that the leaf extract may be of higher medicinal value when extracted during the noon time. This also provides a scientific explanation to the age old practice in our homes of not using the Tulsi leafs for any purpose after sunset.

I. Introduction

Chlorophyll is a green pigment found in all plants, algae and cyanobacteria (blue-green algae). Vital for photosynthesis, chlorophyll allows plants to obtain energy from light by converting the sun's rays into chemical energy. Chlorophyll is built around a structure known as a porphyrin ring, common to a variety of naturally occuring organic molecules. Chief among these is hemoglobin, the substance in human and animal blood which carries oxygen from the lungs to the other tissues and cells of the body. The main difference between heme (the oxygen carrying portion of hemoglobin) and chlorophyll is that the porphyrin ring of hemoglobin is built around iron (Fe) and the porphyrin ring of chlorophyll is built around magnesium (Mg).[1]

Scientific evidence has shown that chlorophyll and the nutrients found in green foods offer protection against toxic chemicals and radiation. In 1980, Dr. Chiu Nan Lai at the University of Texas Medical Center reported that extracts of wheatgrass and other green vegetables inhibit the cancer-causing effects of two mutagens (benzopyrene and methylcholanthrene).[2] Chlorophyll-rich plant extracts, as well as water solutions of a chlorophyll derivative (chlorophyllin), dramatically inhibit the carcinogenic effects of common dietary and environmental chemicals.[14, 15] Reports have shown that certain vegetables significantly reduced mortality in rats exposed to lethal doses of X-rays. [6] In a later study, the some vegetables were shown to reduce the damage caused by radiation. [7] Chlorophyll also has many therapeutic uses. Among these are wound healing, (3) intestinal regularity, (4) reducing cholesterol, (5) detoxification and deodorization have been reported and established. Chlorophyll provides an unique way to address these issues because, through experiments and trials on humans and test animals, chlorophyll therapy has always been shown to have no toxicity (absolutely zero toxic side effects) — whether ingested, injected or rubbed onto your skin.(3)

In India, Hindus have long cultivated Tulsi (Ocimum tenuiflorum L) as a religious plant. It is said to aid meditation and is believed to be endowed with the spiritual power to transform souls. It can be found in homes and temples, where its leaves are a common part of worship routines. Botanically, it belongs to the mint family (*Lamiaceae*). The leafs are also a major ingredient for

local medicines that bring relief to – fever, sting from insects, itching of skin etc. In India, there also exists the practice that the leaf of this plant is not taken for any purpose after sunset. This intrigued us to study the effect of sunlight on the chlorophyll content in the leaf of Ocimum tenuiflorum L which is a plant of very significant cultural value to India.

II. Experimental

Ocimum tenuiflorum leaf was collected from different plants at 07:00 am, 9:30 am, 11:30 am, 12:30 pm, 02:30 pm and 04:30 pm. The leaf was cleaned and then grinded with a mortar without addition of any water till a paste form was obtained. The paste was then diluted so as to be available in sufficient quantity to be taken in the cuvette of 3 ml.

III. Results and Discussion

Absorption spectrum of the extract from Ocimum leaf taken at different times of a day is shown in figure 1. We have measured the leaf extract of Ocimum taken at 07:00 am, 9:30 am, 11:30 am, 12:30 pm, 02:30 pm and 04:00 pm in the present study. We have observed only one peak in the extract collected centered around ~ 665 nm. As is evident from the figure, one can reason that there is a progressive time dependence on the magnitude of optical absorption for the extract upto 02:30 pm and after which the magnitude decreases.

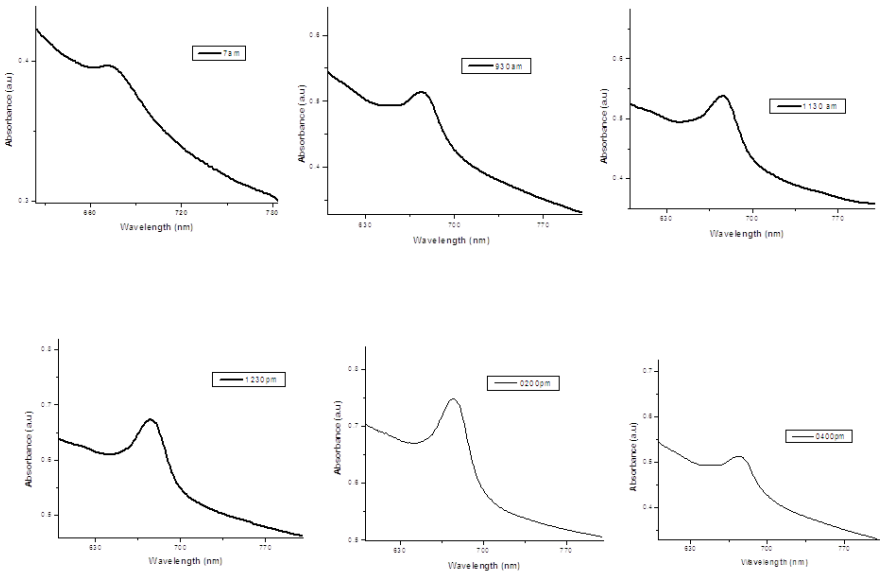

Figure 1: Optical absorption of extract collected at different time of the day.

Figure 2 shows a plot of area under the absorption peaks for the leaf extract. It clearly proves the time dependence of the absorption spectrum of the pigment. The observations provided direct evidence on the controlled release of chlorophyll pigment by the leaf. One of the variables during the collection of the extract was the intensity of the incident sunlight.

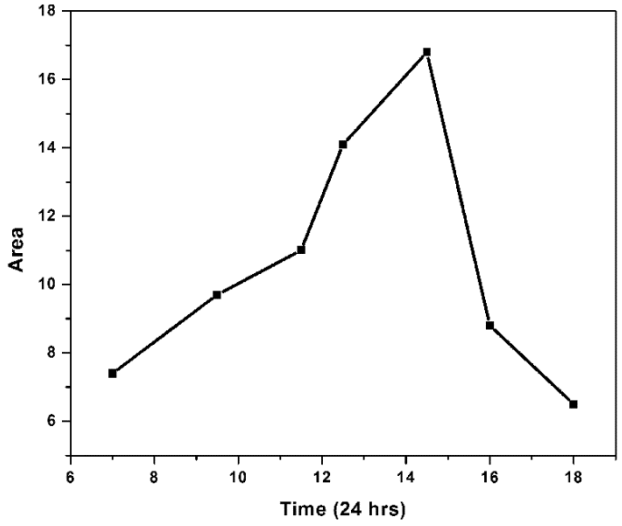

Figure 2: Area under the curve calculated from figure 1.

IV. Conclusions

We have observed only one peak in the extract collected centered around ~ 665 nm. This corresponds to the pigment chlorophyll A. There is a temporal dependence in the concentration of the pigment. This can be related to the amount of sun shine available. It is known that sunlight is essential for photosynthesis and as the available amount of sun light changes during day time there is a proportionate change in the amount of chlorophyll A pigment in the extract collected.

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