

DETERMINATION OF O₂ MOLECULES PRESENT IN PLANT LEAVES EXTRACT

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ABSTRACT

Holy basil (*Ocimum tenuiflorum*) is an aromatic plant in the family Lamiaceae which is native to the Indian subcontinent and widespread as a cultivated plant throughout the Southeast Asian tropics. This plant leaves have powerful antibacterial, antifungal and anti-inflammatory properties. In ayurvedic medicine, holy basil has been used to treat a variety of conditions – everything from the common cold to bronchitis to fever to certain digestive complaints, including ulcers. Multiple scientific studies examining the property, of *ocimum tenuiflorum* of combating stress, have found that supplementation with various extracts of holy basil decrease stress hormone levels, corticosterone in particular.^[7] Therefore, in this research article the natural plant extract of the leaves is subjected to the method designed by me to calculate the number of oxygen molecules present in it. The examine of this plant extract by applying simple calculations is found and it was observed that the leaves of holy basil contains very high number of oxygen molecules which probably a reason which contributes human body to restore the oxygen molecules in great amount that's why the plant leaves proves beneficial to human body from any angle.

KEYWORDS: *Ocimum tenuiflorum*, Properties, Hormone, Corticosterone, Stress, Oxygen

INTRODUCTION

Oxygen is a chemical element with symbol O and atomic number 8. It is a member of the chalcogen group on the periodic table and is a highly reactive nonmetal and oxidizing agent that readily forms oxides with most elements as well as other compounds.^[1] By mass, oxygen is the third-most abundant element in the universe, after hydrogen and helium.^[2] At standard temperature and pressure, two atoms of the element bind to form dioxygen, a colorless and odorless diatomic gas with the formula O₂. This is an important part of the atmosphere and diatomic oxygen gas constitutes 20.8% of the Earth's atmosphere.^[3]

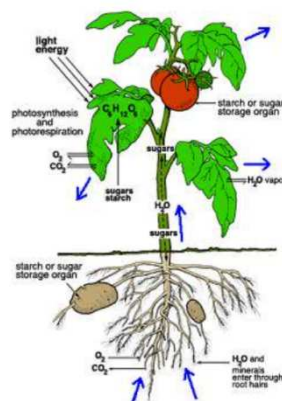


Figure 1: Process of Uptake of Oxygen

Dioxygen is used in cellular respiration and many major classes of organic molecules in living organisms contain oxygen, such as proteins, nucleic acids, carbohydrates, and fats, as do the major constituent inorganic compounds of animal shells, teeth, and bone. Most of the mass of living organisms is oxygen as a component of water, the major constituent of lifeforms. Conversely, oxygen is continuously replenished by photosynthesis, which uses the energy of sunlight to produce oxygen from water and carbon dioxide. Oxygen is too chemically reactive to remain a free element in air without being continuously replenished by the photosynthetic action of living organism. Plants need oxygen to survive but the difference is in day time they use carbon dioxide and sunlight for the photosynthesis process and emit oxygen out but in the night time due to absence of sunlight plants take oxygen and give out carbon dioxide.^[4]



Figure 2: Holy Basil (*Ocimum tenuiflorum*)

Holy basil is a plant originally from India and is used in Ayurvedic medicine as an “adaptogen” to counter life stresses. Holy basil is used for treating various diseases such as common cold, H1N1 flu, diabetes, asthma, bronchitis, earache, headache, stomach upset, heart disease, fever, viral hepatitis, malaria, stress and tuberculosis. It is also used for mercury poisoning, to promote longevity, as a mosquito repellent and to counteract snake and scorpion bites. Chemicals in holy basil are thought to decrease pain and swelling and might lower blood sugar in people with diabetes.

Among all these things some early researches proved that:

- Taking 500 mg of holy basil leaf extract twice daily after meals for 60 days reduced anxiety and associated stress and depression in people with anxiety
- Taking 400mg of a holy basil extract (M/s Natural remedies Pvt. Ltd, India) by mouth in the morning and 800 mg at night for 6 weeks decreased symptoms of stress, including forgetfulness, sexual problems, exhaustion and sleep problems like insomnia.^[5]

For determining the above causes a new experiment is developed to calculate how many number of oxygen molecules is there present in plant extract.

DETERMINATION OF MOLECULES OF OXYGEN PRESENT IN PLANT LEAVES EXTRACT

AIM

To determine the no. of molecules of oxygen (O₂) present in plant leaves extract using Siddhesh's Method

PRINCIPLE

In this experiment, holy basil (*Ocimum tenuiflorum*) leaves extract is taken as sample for testing no. of molecules of O₂ present in it. The sample is subjected to CuSO₄ which after mixing with sample turns green. Initially, when CuSO₄ enters in water it dissociates in Cu ions and sulphate ions. These Cu ions are oxidized by the oxygen present in leaf sample which turns solution green forming reaction:



Excess drops of CuSO₄ should be added and kept for 25-30 mins which will form following reaction and gives red sedimentation:



The particles of cuprous oxide precipitated has to be measure which formed pellet and the remaining excess Cu ions with sulphate and other materials of plant remain in supernatant. For measuring the thickness of pellet form it has to be rise above from the bottom and hence a material heavier than both supernatant and pellet has to be introduce in eppendorf tube. This is achieved by adding a crystal of sodium thiosulphate which gets dissolved at bottom thus lifts both supernatant and pellet. Then quickly thickness of pellet should be measured with scale when it rises because following reaction starts taking place:



After this reaction took place, whole solution turns yellow because of formation of copper thiosulphate and after some times yellow precipitate gets formed. Hence, the pellet has to be measured quickly when it rises and proper calculation by using dimensions should be apply as shown in sample calculations.

REQUIREMENTS

Holy basil's leaf extract

5% CuSO₄ (diluted in distilled water)

Sodium Thiosulphate Na₂S₂O₃ in crystal solid form

Dropper

Sterile Scissor

Micropipette

Sterile eppendorf tubes

Measuring scale

PROCEDURE

- Take leaves of holy basil make cuts by folding leavings and keep in 2ml distilled water for 24 hrs.
- On next day, take 500 μl (or as per requirement) of extract in other eppendorf put 5% CuSO_4 using dropper till the yellow solution turns green.
- After solution turn green add 3-4 drops extra CuSO_4 , and keep the solution for 25-30 mins in vertical position which will give red precipitation (Cuprous oxide) which can be visible in white tube light.
- Add crystal of Sodium thiosulphate in the centre of eppendorf
- After dissolving of crystal quickly measure the thickness of band using scale. (NOTE: Do not let the solution turn yellow, technique and personal handling must be proper while performing this step)
- Note down the thickness

OBSERVATION



Figure 3: Holy Basil's Leaves Extract



Figure 4: Green Solution and CuSO_4



Figure 5: Formation of Precipitation after 30 mins



Figure 6: Rising of Pellet after Addition of Crystal

CALCULATIONS

Diameter of eppendorf=1 cm, thickness of Cu₂O= 0.2cm

Volume of Cu₂O=Area x thickness=0.1570 cm³

Density of Cu₂O=(Mass/volume)

Mass of band formed=(6 x 0.1570)=0.942 grams

Moles of O (nascent) = (Mass/Molar mass)=(0.942/16)=0.0588 moles

By Avogadro's rule,

1 mole=6.022 x 10²³ atoms^[6]

0.0588 mole= x atoms

x=3.5409 x 10²² atoms of O present

Diatomic Oxygen=O₂= (3.5409 x 10²²)/2= 1.77045 x 10²² molecules of O₂

CONCLUSIONS

The sample of holy basil leaves was tested using Siddhesh's method and there were 1.77045 x 10²² molecules of O₂ found. The numbers of oxygen molecules were very high compared to other plants leaves extract. These many molecules were just present in 500 µl of plant extract hence no doubt when the extract is consumed in high volume many molecules of diatomic oxygen gets entered in the body which recovers the O₂ depleted in human body and also oxygen in greater amount in human body helps the smooth metabolic functioning of body. Hence, this must be one of the reasons that extract of this plant proves beneficial to human health.

APPENDIX

CHEMICALS NAME

CuSO₄ – Copper sulphate

O – Monoatomic oxygen

O₂ – Diatomic oxygen

H₂O – Water

Na₂S₂O₃– Sodium thiosulphate

CuO – Copper Oxide (I)

Cu₂O – Copper Oxide (II) [Cuprous Oxide]

NaOH – Sodium Hydroxide

Cu₂S₂O₃– Copper thiosulphate

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