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Analysis of Chlorophyll Contents in Herbal Plants from Dr. Babasaheb Ambedkar Marathwada University, Aurangabad Campus using Field Spec 4 Spectroradiometer

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Abstract: ***Since time immemorial mankind has utilized plants for their medicinal values. Several branches of science like ayurvedic medicine, unani medicine etc put paramount amount of importance on plant extracts for the cure of multitude of diseases. The plant leaf identification is a critical task manually and computationally. Hyper spectral non-Imaging data provides the spectral range from 400-2500 nm which has the ability to identify each and every unique material on the surface. Non-Imaging hyperspectral data is a non-destructive, rapid, and less expensive. Estimating the chlorophyll content in common herbal plant leaves could help understand their medicinal properties better. The objective of this study is to collect spectral signatures of chlorophyll content from herbal plant. To develop our own spectral database using FieldSpec 4 Spectroradiometer, identification and analysis of the Chlorophyll content from medical plant which are easily available in our households such as (Asparagus, Tulsi, Neem, Panfuti, Tridax, Justica) samples using statistical methods.***
Keywords: Fieldspec4, Spectroradiometer, Remote Sensing

I. INTRODUCTION

Herbal plants are a extensive source for the traditional medicine & herbal industry but also add livelihood and health security to a large segment of Indian population. herbal plants are resources of new drugs. herbal plants are important for human health. Asparagus, Tridax, Justica, Tulsi, Neem, Panfuti there are six plant used this study. These plants have been used from the prehistoric times to current day. These plants based medicines are absorbed in all civilizations. It is accept that the herbal medicine can give good effect to body without causing side effects to human's body. Besides, the usage of herbal plants has been increasing as an important role that can support the economic system. The medical plants for health are used as herbal treatments and therapies that can be new habits for Indian culture. They have been used in the country for a long time for their medicinal properties. Non-imaging data provides the spectral range from to 350 nm to 2500nm which Hyperspectral has the ability to identify each and every unique material on the surface.[1][6][20]. The medical plants identification is critical task manually and computationally. A Hyperspectral image can be considered as an image cube where the third dimension is represented by 100 of contiguous spectral bands. As a result, a Hyperspectral pixel is literally a column vector with dimensions equal to the number of spectral bands. Such as between narrow bands spectral information is useful and can be used for spectral characterization [1][2][18]. A Hyperspectral imaging sensor combines imaging and spectroscopy in a single system that often add large datasets and requires new processing methods. Hyperspectral datasets are generally composed of approximately 2150 or more spectral bands with relatively narrow bandwidths (5-10 nm) [1],[3][19]. As an important research job in recent decades, plant leaf identification based on leaf has been carried out by botanists, plant specialist and many scientists. It is shown that, many studies have been created for the leaf species identification using non imaging spectrodiometer hyperspectral data[6][7]. However, there is slight works touching upon the identification of herbal plant leaf that based on hyperspectral data since hyperspectral data has special characteristics, such as two thousand one hundred fifty of spectral values with high spectral resolution, etc. The development of a quick and efficient identification of herbal plant leaf from hyperspectral data is a strong challenge. The spectral reflectance signature of dynamic structure provides information that closely reflects their physiological status. Because of its high potential for the evaluation of geomorphic biological specification, particularly of gross photosynthesis of herbal plants, two-dimensional spectroscopy, via the use of hyperspectral instruments, has been generally used in remote sensing applications [4][15][17]. Leaf chlorophyll content provides valuable information around physiological status of plants. The objective was to study the spectral behaviour of the relationship between reflectance and chlorophyll content and to develop a technique for non-destructive chlorophyll estimation in leaves with a wide range of pigment

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content and composition using reflectance in a few broad spectral bands [5][8][16]. This study is related to chlorophyll content identification from herbal plants using non-imaging hyperspectral data .With the help of spectral signatures of medical plants,it helps to identify the herbal plant and content available in herbal plant.

II. STUDY AREA

The geographical location of the study area is 19054'3.7944 N latitude and 75021'8.9208 E longitude of Aurangabad (MS) Maharashtra, India**.**

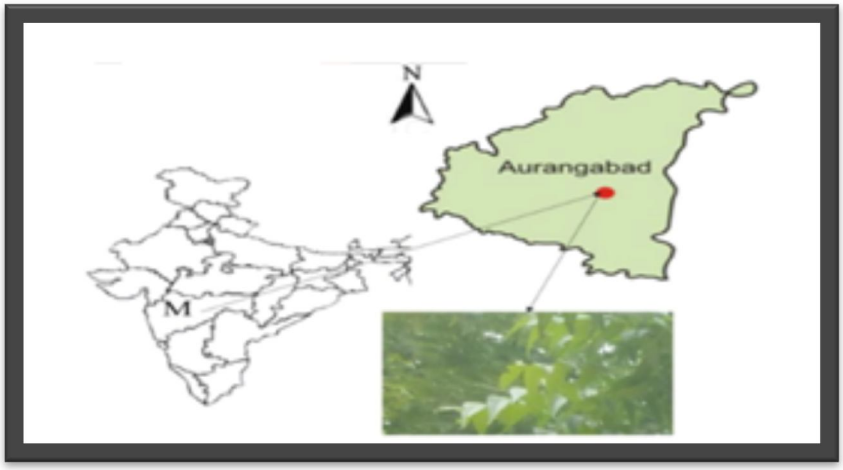


Fig 1: Study area[[9][10]

III. DATA COLLECTION

In this study, we have collected six plants as a sample which is available in Dr. Babasaheb Ambedkar Marathwada University campus. Collection of Asparagus, Tridax, Justica, Tulsi, Neem, Panfuti, We plucked one samples from each plant and one sample scan the 10 times. We used fresh leaves since it measure of chlorophyll and water which it directly effects on the spectral signature of leaf.[11] The overall dataset of 60 (10*6=60) leaf samples. During the collection process we have also considered and make the geo-tag references of each plant which will be considered as a metadata. The fieldSpec4 instrument was used for give the spectral signatures from leaf samples. The ASD Field Spec 4 Spectrodiometer is used to acquire spectral signature of the samples. The wavelength of the instrument is 350-3500nm[1][6][12].White reference panel is used for optimization and calibration before sample recording. The ASD instrument provides halogen lamp with 7w.It is used to record the plant leaf samples by zenith angle of 60 degree from the distance of 45cm above the samples. The field of view is 8 degree and fiber optic cable was set as of nadir where plant samples. Each sample recorded ten times for receiving spectra and the averaged as a pure spectrum. The RS3 (version 6.3) in built software was used for recording the reflectance spectra leaves[6][13]. Finally we obtained (.asd) data file by using fieldSpec4 which possesses ASCII data format[14].

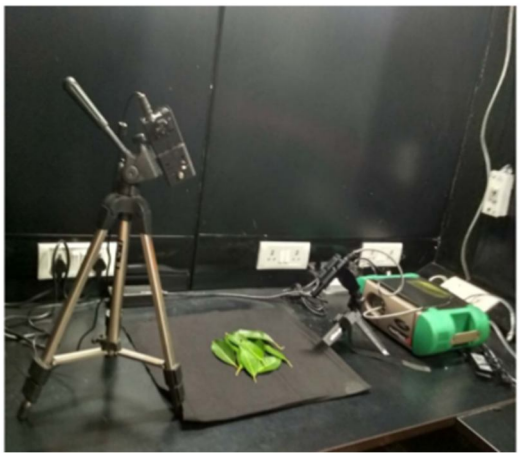


Figure 2.a :FieldSpe4 Spectroradiometer Setup for Spectral measurement

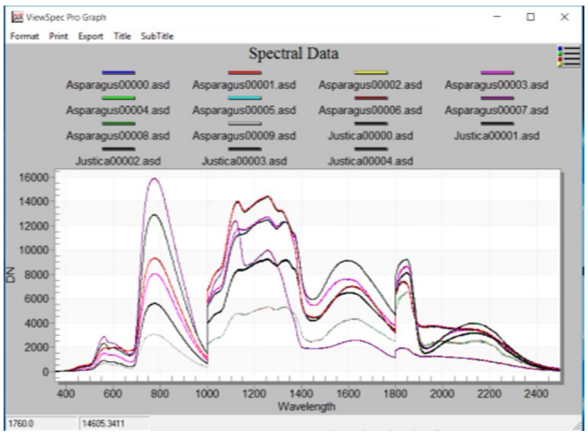


Figure 2.b: Raw DN Spectral signatures of Plant samples

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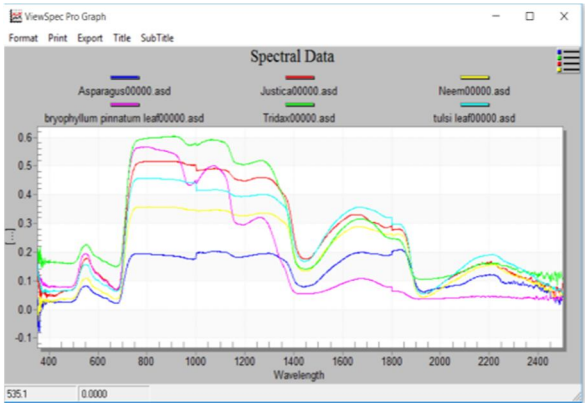


Figure 2.c :Raw Reflectance of Spectral signatures of 6 Plant samples

IV. STATISTICAL ANALYSIS

Statistical analysis of chlorophyll content in the herbal plants such as Tulsi, Tridx, Panfuti, Neem, Asparagus and Justica is calculated in terms of mean, maximum, minimum, median ,variance and standard deviation of chlorophyll shown in below table 01.The table shows Tridax and Panfuti with average values of chlorophyll 0.18% and 0.25% respectively. The percentage of Tridax concentrations were highest values as compared to other plants. The Tridax varied from 0.23% and 0.16%, Justica is varied from 0.18% and 0.05%, Tulsi is varied from 0.16% to 0.06%. Whereas Neem percentage of chlorophyll is 0.20% is varied with 0.11% and 0.03%. Average of chlorophyll value of Asparagus and tulsi is obtained like 0.04% and 0.09%.

Table 1: Statistical Analysis of Medical Plants study

Plant	Mean	Max	Min	Median	Variance	Standard deviation
Asparagus	0.04	0.08	0.03	0.03	0.000	0.010
Justica	0.090	0.18	0.05	0.07	0.002	0.040
Neem	0.050	0.11	0.03	0.04	0.001	0.02
Panfuti	0.11	0.19	0.08	0.08	0.001	0.04
Tridax	0.18	0.23	0.16	0.17	0.001	0.02
Tulsi	0.09	0.16	0.06	0.07	0.001	0.03

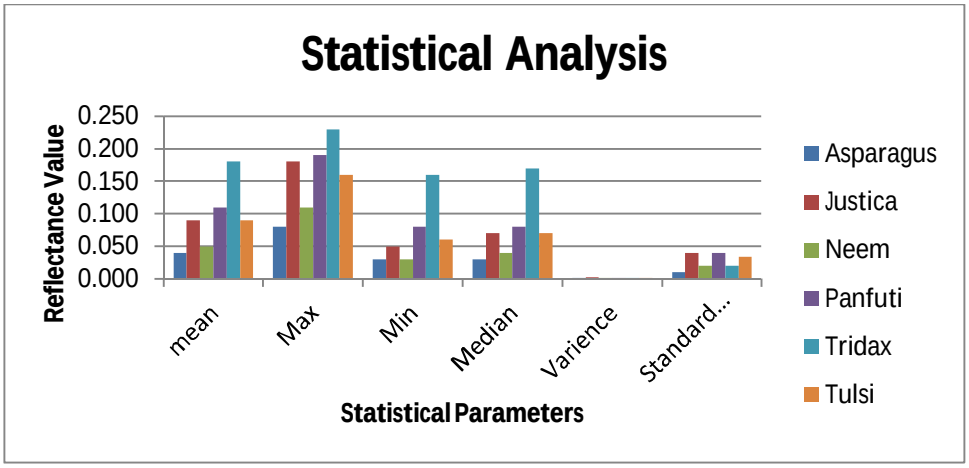


Figure 03: Graphical Representation of medical plants

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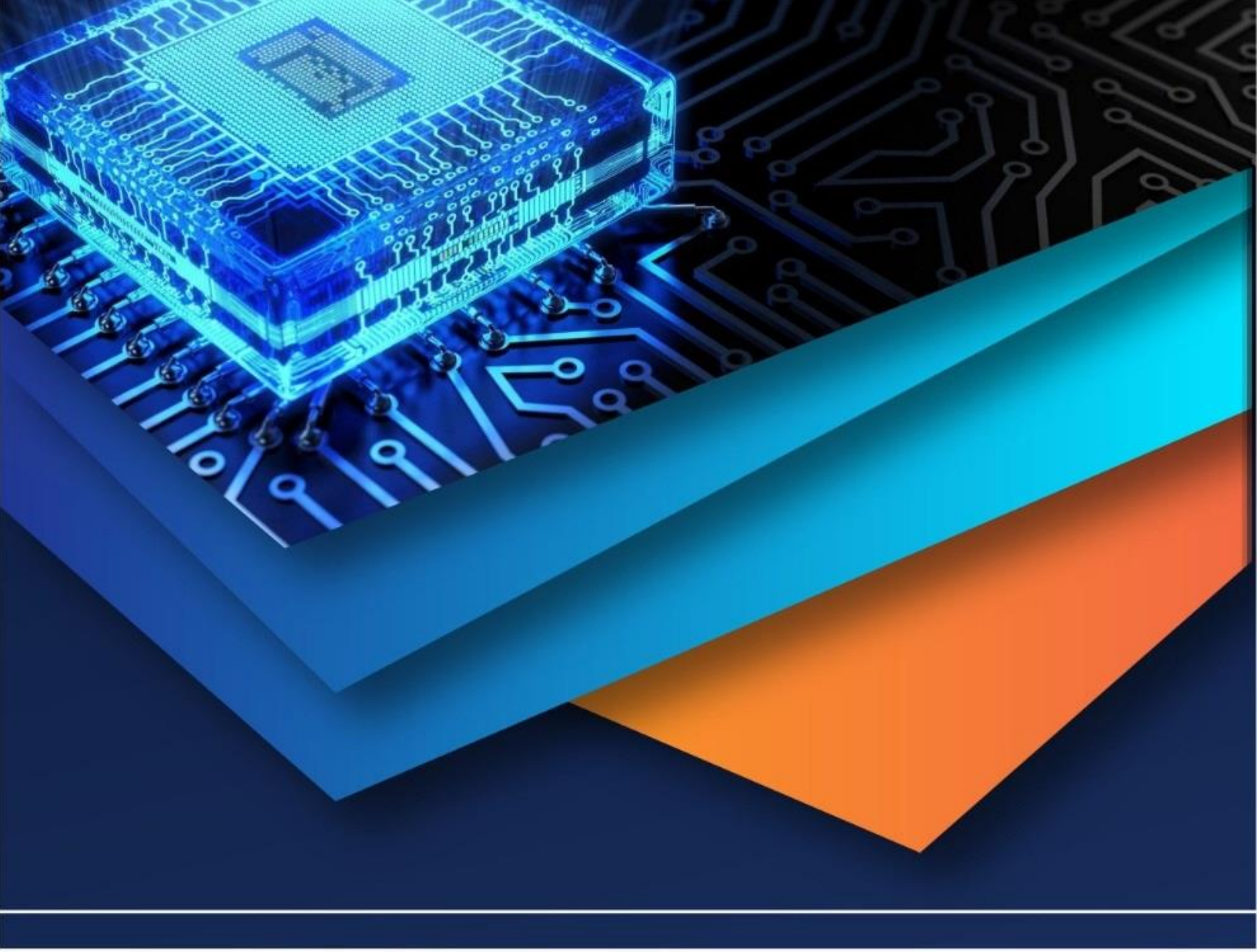
V. CONCLUSION

This study explore the use of Non-Imaging hyperspectral data and statistical methods for identification and analysis of chlorophyll contents from (Asparagus, Tulsi, Neem, Panfuti, Tridax, Justica). In this study we collect spectral signatures of herbal plants in Geospatial Technology Research Laboratory using Non-Imaging FieldSpec4 Spectroradiometer instrument. We have also done the statistical analysis of all herbal plants in terms of statistical parameters such as mean, maximum, minimum, median, variance and standard deviation. According to statistical analysis percentage of chlorophyll contents in Tridax leaves gives very highly reflectance as compared to other herbal plants and we got reflectance chlorophyll content at 400nm and 600nm wavelength. The present study provide a natural source of chlorophyll so as to attain the health benefits of chlorophyll readily without using any chemical supplements.

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