



**M.Sc. Forestry & Environmental Sciences IV Sem. 2023-24**

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**COMPARISON BETWEEN CARBON STOCK OF FOREST AND TREE OUTSIDE FOREST IN CENTRAL  
INDIA LANDSCAPE**



A DISSERTATION SUBMITTED

TO

PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE

DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES (FOREST MANAGEMENT)

BY

**Aryan Pandey**

Enrollment No: GGV/18/6063

Batch: 2023-24

UNDER THE SUPERVISION OF

Dr. Garima Tiwari

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GURU GHASIDAS VISHWAVIDYALAYA

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2024

## CERTIFICATE

This is to certify that ARYAN PANDEY has carried out his Dissertation in partial fulfillment of the requirement for the degree of Master of Science in FORESTRY AND ENVIRONMENTAL SCIENCE on the topic “COMPARISON BETWEEN CARBON STOCK OF FOREST AND TREE OUTSIDE FOREST IN CENTRAL INDIA LANDSCAPE” during May 2024 to July 2024. The project was carried out at the GURU GHASIDAS VISHWAVIDALYA BILASPUR CHHATTISGARH.

To the best of our knowledge the Dissertation embodies the original work of the candidate.

Date: 6<sup>th</sup> September 2024

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## SUMMARY REPORT ON FOREST ATTACHMENT AND INDUSTRIAL TRAINING



A REPORT SUBMITTED

TO

PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE

DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES (FOREST MANAGEMENT)

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This is to certify that ARYAN PANDEY has carried out his Dissertation in partial fulfillment of the requirement for the degree of Master of Science in FORESTRY AND ENVIRONMENTAL SCIENCE on the topic “SUMMARY REPORT ON FOREST ATTACHMENT AND INDUSTRIAL TRAINING” during July 2024 to August 2024. The project was carried out at the GURU GHASIDAS VISHWAVIDALYA BILASPUR CHHATTISGARH.

To the best of our knowledge the Dissertation embodies the original work of the candidate.

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**PHYTOSOCIOLOGICAL AND SOIL ANALYSIS OF  
GRASS LAND ECOSYSTEM OF ACHANAKMAR-  
AMARKANTAK BIOSPHERE RESERVE**



ADSSERTATIONSUBMITT TO

PARTIALFULFILLMENTOF THEREQUIREMENTFOR THE  
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(FOREST MANAGEMENT)

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This is to certify that Report Dissertation entitled **"ASSESSMENT OF PHYTOSOCIOLOGICAL AND SOIL ANALYSIS OF GRASS LAND ECOSYSTEM OF ACHANAKMAR-AMARKANTAK BIOSPHERE RESERVE"** submitted in partial fulfillment of the requirements for the Degree of **MASTER OF SCIENCE in FORESTRY & ENVIRONMENTAL SCIENCES**. This dissertation is the bonafide record carried out by Mr. Ayush chandrakar under my supervision and guidance.

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**A  
DISSERTATION**

**On**

**“SOIL NUTRIENT STATUS OF PLANTATION OF DIFFERENT PLANTS IN SIPAT,  
BILASPUR (C.G)”**

**SUBMITTED FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENT OF**

**THE MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES**

**(FOREST MANAGEMENT)**



**BATCH: 2022-2024**

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Department of Forestry, Wildlife and  
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Guru Ghasidas Vishwavidyalaya, Bilaspur  
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**On**

**“A REPORT ON FOREST ATTACHMENT, INDUSTRIAL TRAINING”**

**SUBMITTED FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENT OF**

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This is certified that **Mr. Ghanshyam jaiswal**, the student of M.Sc. Forestry & Environmental Science at the Department of Forestry, Wildlife and Environmental Science, Guru Ghasidas Vishwavidyalaya, Bilaspur (C. G), has successfully completed the Forest Attachment Training in Kanan Pendari Zoo under the supervision of **Dr. Atul Kumar Bharadwaj**, Department of Forestry, Wildlife and Environmental Science, And **Mr.U.R. Ganesh, Director**, ATR & Kanan Penadri Zoo.

During the attachment, Mr. Ghanshyam Jaiswal actively participated in various forestry and environmental conservation activities, gaining practical insights and hands-on experience in the field. His dedication, enthusiasm, and commitment to learning have been commendable. We acknowledge his efforts and contribution to the conservation and sustainable management of Forests during the period of attachment.

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**REPORT**

**On**

**“INDUSTRIAL TRAINING (NWFP MART & HONEY PROCESSING CENTER, MUSHROOM CULTIVATION, VERMICOMPOST AND APICULTURE)”**

**SUBMITTED FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENT OF**

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**(FOREST MANAGEMENT)**

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I wish him all the success in his future academic endeavors.

A handwritten signature in black ink, appearing to read 'Atul Kumar', is written over a circular stamp.

**Dr. ATUL KUMAR**  
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(Supervisor)

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On

**PHYSICO-CHEMICAL PROPERTIES OF SOIL UNDER DIFFERENT LAND  
USE SYSTEMS IN BILASPUR CHHATTISGARH**

**SUBMITTED FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENT OF  
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ACADEMIC SESSION: 2023-2024**

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**DEPARTMENT OF FORESTRY, WILDLIFE AND ENVIRONMENTAL SCIENCES**  
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(A CENTRAL UNIVERSITY ESTABLISHED UNDER CENTRAL UNIVERSITY ACT 2009, No.25 OF 2009)

**CERTIFICATE**

I have great pleasure in certifying that **Miss Harsha Rani Tandan D/o Mr Anuj Kumar Tandan** is a regular student of M.Sc. Forestry 4th Semester during the session of 2023-24 of **Department of Forestry, Wildlife & Environmental Sciences, GGV, Bilaspur, Chhattisgarh.** She has completed the Dissertation entitled **“Physico-chemical properties of different land use systems in Bilaspur Chhattishgarh”**

I wish her all the success in his future academics.

**Prof. S. C. TIWARI**

**PROFESSOR**

DEPARTMENT OF FORESTRY,  
WILDLIFE AND ENVIRONMENTAL SCIENCES  
GURU GHASIDAS VISHWAVIDYALAYA  
BILASPUR C.G.





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DEPARTMENT OF FORESTRY, WILDLIFE AND ENVIRONMENTAL SCIENCES  
GURU GHASIDAS VISHWAVIDYALAYA, KONI, BILASPUR, CHHATTISGARH

(A CENTRAL UNIVERSITY ESTABLISHED UNDER CENTRAL UNIVERSITY ACT 2009, No.25 OF 2009)



(A CENTRAL UNIVERSITY)

**A Report**

On

**“FOREST ATTACHMENT AND INDUSTRIAL TRAINING”**

SUBMITTED FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENT OF  
THE MASTERS DEGREE OF SCIENCE IN FORESTRY  
ACADEMIC SESSION: 2023-2024

SUBMITTED BY:

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M.SC FORESTRY 4<sup>TH</sup> SEM  
ROLL NO: 21078104  
ENROLLMENT NO.: GGV/18/6088

UNDER THE SUPERVISION OF:

**Prof. S. C. TIWARI**  
Professor  
DEPARTMENT OF FORESTRY  
WILDLIFE AND ENVIRONMENTAL  
SCIENCES GGV, BILASPUR, C.G



**DEPARTMENT OF FORESTRY, WILDLIFE AND ENVIRONMENTAL SCIENCES**  
**GURU GHASIDAS VISHWAVIDYALAYA, KONI, BILASPUR, CHHATTISGARH**

(A CENTRAL UNIVERSITY ESTABLISHED UNDER CENTRAL UNIVERSITY ACT 2009, No.25 OF 2009)

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I have great pleasure in certifying that **Miss. Harsha Rani Tandan** D/o Mr. Anuj Kumar Tandan is a regular student of M.Sc. Forestry 4th Semester during the session of 2023-24 of **Department of Forestry, Wildlife & Environmental Sciences, GGV, Bilaspur, Chhattisgarh**. She has completed the “**Forest Attachment and Industrial Training**” for partial fulfillment of the requirement for the degree of masters

I wish her all the success in his future academics.

**Prof. S.C. TIWARI**

**PROFESSOR**

DEPARTMENT OF FORESTRY,  
WILDLIFE AND ENVIRONMENTAL SCIENCES  
GURU GHASIDAS VISHWAVIDYALAYA  
BILASPUR C.G



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## Understanding the Drivers and Impacts of Human-Sloth Bear Conflict in the Marwahi Forest Range, Chhattisgarh, India

*Dissertation*

Submitted to

**Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh**  
(A Central University)

for the Degree of

**MASTER OF SCIENCE**

in

**FORESTRY AND ENVIRONMENTAL SCIENCES**

**(FOREST MANAGEMENT)**

(School of Natural Resources)



By

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M.Sc. Forestry IV Semester

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Enroll No: GGV/22/06701

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Bilaspur-495009, Chhattisgarh

**2024**





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I wish him all the success in his academic endeavors.

  
Dr. Ajay Kumar Singh  
Supervisor



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## STATE FOREST ATTACHMENT & INDUSTRIAL TRAINING

### *Report*

Submitted to

**Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh**  
(A Central University)

for the Degree of

**MASTER OF SCIENCE**

in

**FORESTRY AND ENVIRONMENTAL SCIENCES**

**(FOREST MANAGEMENT)**

(School of Natural Resources)



By

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11/9/2024  
Dr. Ajay Kumar Singh  
Supervisor



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A

DESSERTATION

ON

**Carbon sequestration of Miyawaki Plantation in Bhlmi, Bilaspur, (C.G.)**



A DISSERTATION SUBMITTED

TO

PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE  
DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES  
(FOREST MANAGEMENT)

Session: 2023-24

BY

HEMANT SURYAWANSHI

Enrollment No: GGV/18/6091

UNDER THE SUPERVISION OF

Dr. K.K. CHANDRA

Professor

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**SCHOOL OF NATURAL RESOURCES**

**GURU GHASIDAS VISHWAVIDYALAYA**

(A Central University established by the Central Universities Act 2009, NO. 25 of 2009)





Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

(A central University established under Central University Act 2009, No. 25 of 2009)

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This is to certify that this report entitled "Carbon sequestration of Miyawaki plantation in Bhilmi, Bilaspur, (C.G.)". Submitted by HEMANT SURYAWANSHI In partial fulfillment and of the requirement of the award of the degree of master of science in (Forestry and Environmental science) under Guru Ghasidas Vishwavidyalaya Bilaspur Chhattisgarh, is the outcome of an original research work carried out by her under my Supervision. The work has been carried out in Department of Forestry & Environmental Science And the results embodied in this report is original and have not been previously submitted either In part of full to any other institution for the award of any degree or diploma. I wish him all success in his future endeavors.

A handwritten signature in blue ink, appearing to be 'd' followed by a long horizontal stroke.

Supervisor

Prof. K.K Chandra

(Head of Department)

Forestry, Wildlife and

Environmental Science

Guru Ghasidas Vishwavidyalaya

Bilaspur C.G.



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**SUMMARY REPORT OF FOREST ATTACHMENT WITH BILASPUR  
RESEARCH & EXTENSION AND INDUSTRIAL TRAINING  
REPORT, AT KRISHI VIGYAN KENDRA, BILASPUR**



A REPORT

SUBMITTED TO

**PARTIAL FULFILLMENT FOR THE REQUIREMENT OF  
DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES  
(SPECIALIZATION IN FOREST MANAGEMENT)**

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**KONI, BILASPUR (C.G) 495009**

**2024**



## Guru Ghasidas Vishwavidyalaya, Bilaspur (CG)



(A central University established under Central University Act 2009, No. 25 of 2009)

### CERTIFICATE

This is to certify that this report entitled "Forest attachment under Research and extension and industrial training at KRISHI VIGYAN KENDRA Bilaspur (CG)". Submitted by HEMANT SURYAWANSHI in partial fulfillment and of the requirement of the award of the degree of master of science in (Forestry and Environmental science) under Guru Ghasidas Vishwavidyalaya Bilaspur Chhattisgarh, is the outcome of an original research work carried out by her under my supervision, the work has been carried out in Department of Forestry & Environmental Science and the results embodied in this report is original and have not been previously submitted either in part or full to any other institution for the award of any degree or diplomas

I wish him all success in his future endeavors,

**Supervisor**

Prof. K.K Chandra (Head of Department)

Forestry, Wildlife and Environmental Science

Guru Ghasidas Vishwavidyalaya

Bilaspur C.G



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DEPARTMENT OF FORESTRY WILDLIFE AND ENVIRONMENTAL SCIENCES  
GURU GHASIDAS VISHWAVIDYALAYA, KONI, BILASPUR (C.G) 495009  
(A Central University established by the Central Universities Act 2009, NO. 25 of 2009)

[A Central University]

A

Report

On

“Assessment of dust capturing capacity of selected species from  
industrial area of Bilaspur, Chhattisgarh”

SUBMITTED FOR PARTIAL FULFILLMENT OF THE REQUIREMENT OF

THE MASTER DEGREE IN FORESTRY AND ENVIRONMENTAL SCIENCES

Academic session: 2023-24



SUBMITTED BY

MD. AFFAN HAQUE  
M. Sc FORESTRY 4<sup>TH</sup> SEMESTER  
ROLL NO: 22078108  
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UNDER THE SUPERVISION OF:

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Department of Forestry, Wildlife and Environmental Sciences

**Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)**

(A Central University established under Central University Act 2009, No.25 of 2009)



**CERTIFICATE**

This is to certify that the Dissertation entitled “**Assessment of dust capturing capacity of selected species from industrial area of Bilaspur, Chhattisgarh**” Submitted in partial fulfilment of the requirements for the degree of **Master of science in forestry and environmental Sciences** in Department of Forestry, wildlife & Environmental Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur (Chhattisgarh) is the work carried out by **Mr. MD. Affan Haque, S/O Mr. Anbarul Haque** under my supervision and guidance.

I wish him all the success in his academics

Date: 09/09/2024

Place: Bilaspur

**Dr. Brijendra Pratap Singh**  
(Supervisor)

Assistant Professor of  
Department of Forestry, Wildlife &  
Environmental Sciences, GGU, Bilaspur



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**DEPARTMENT OF FORESTRY WILDLIFE AND ENVIRONMENTAL SCIENCES**

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(A Central University established by the Central Universities Act 2009, NO. 25 of 2009)

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A

Report

On

**FOREST ATTACHMENT**

SUBMITTED FOR PARTIAL FULFILLMENT OF THE REQUIREMENT OF  
THE MASTER DEGREE IN FORESTRY AND ENVIRONMENTAL SCIENCES

**Academic session: 2023-24**



SUBMITTED BY

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**Department of Forestry, Wildlife and Environmental Sciences**  
**Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)**  
(A Central University established under Central University Act 2009, No.25 of 2009)



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This is certified that **Mr. Affan Haque**, the student of M.Sc. Forestry & Environmental Science at the Department of Forestry, Wildlife and Environmental Science, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.), has successfully completed the Forest Attachment Training in Kharagpur & Midnapore Forest Division under the supervision of **Dr. Brijendra Pratap Singh**, Department of Forestry, Wildlife and Environmental Science, And **Mr. Kamal Sarkar**, Director, Hijli Forest Training Institute, Kharagpur, West Bengal.

During the attachment, Mr. Affan Haque actively participated in various forestry and environmental conservation activities, gaining practical insights and hands-on experience in the field. His dedication, enthusiasm, and commitment to learning have been commendable.

We acknowledge his efforts and contribution to the conservation and sustainable management of Forests during the period of attachment.

I wish him all the success in his academics

Date: 09/09/2024

**Dr. Brijendra Pratap Singh**  
Assistant Professor of  
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Environmental Sciences, GGU, Bilaspur



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DEPARTMENT OF FORESTRY WILDLIFE AND ENVIRONMENTAL SCIENCES

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(A Central University established by the Central Universities Act 2009, NO. 25 of 2009)

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A

Report

On

“**INDUSTRIAL TRAINING AND INSTITUTE VISIT**”

SUBMITTED FOR PARTIAL FULFILLMENT OF THE REQUIREMENT OF  
THE MASTER DEGREE IN FORESTRY AND ENVIRONMENTAL SCIENCES

**Academic session: 2023-24**



SUBMITTED BY

**MD. AFFAN HAQUE**  
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**Department of Forestry, Wildlife and Environmental Sciences**  
**Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)**

(A Central University established under Central University Act 2009, No.25 of 2009)



**CERTIFICATE**

This is to certify that the student report entitled “**Industrial Training Report**” submitted in partial fulfillment of the requirements for the Degree of **Master of Science in Forestry to the Department of Forestry, Wildlife & Environmental Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur (Chhattisgarh), Academic session 2023-2024**. This report is the genuine record of the Bonafede carried out by Mr. MD. AFFAN HAQUE under my supervision and guidance. His work was appreciable and satisfactory.

I wish his all the success in his future academic endeavors.

Date: 09/09/2024

**Dr. Brijendra Pratap Singh**

Assistant Professor of  
Department of Forestry, Wildlife &  
Environmental Sciences, GGU, Bilaspur



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**DEPARTMENT OF FORESTRY, WILDLIFE AND ENVIRONMENTAL SCIENCES**  
**GURU GHASIDAS VISHWAVIDYALAYA, KONI, BILASPUR, CHHATTISGARH**

(A CENTRAL UNIVERSITY ESTABLISHED UNDER CENTRAL UNIVERSITY ACT 2009, NO. 25 OF 2009)



**(A CENTRAL UNIVERSITY)**

**A DISSERTATION**

**On**

**"ASSESSMENT OF DIFFERENT ECOSYSTEM SERVICES BASED ON VALUES PROVIDED BY  
URBAN GREEN SPACES OF BILASPUR CITY OF CHHATTISGARH"**

**SUBMITTED FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENT OF**

**THE MASTERS DEGREE OF SCIENCE IN FORESTRY**

**ACADEMIC SESSION: 2023-2024**

**SUBMITTED BY:**

**N. JASMINE**  
M.SC FORESTRY 4TH SEM  
ROLL NO: 22078109  
ENROLLMENT NO.:GGV/18/6113

**UNDER THE SUPERVISION OF:**

**DR.GUNJAN PATIL**  
ASSISTANT PROFESSOR  
DEPARTMENT OF FORESTRY,  
WILDLIFE AND  
ENVIRONMENTAL SCIENCES  
GGV, BILASPUR, C.G



**DEPARTMENT OF FORESTRY, WILDLIFE AND ENVIRONMENTAL SCIENCES**  
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(A CENTRAL UNIVERSITY ESTABLISHED UNDER CENTRAL UNIVERSITY ACT 2009, No.25 OF 2009)

## **CERTIFICATE**

I have great pleasure in certifying that Ms. N.Jasmine D/o N.David Raju is a regular student of M.Sc. Forestry 4th Semester (Forest Management) during the session of 2023-24 of Department of Forestry, Wildlife & Environmental Sciences, GGV, Bilaspur, Chhattisgarh. She has completed the Dissertation entitled “**Assessment of different Ecosystem Services based on values provided by Urban Green Spaces of Bilaspur City Of Chhattisgarh**”

I wish her all the success in his future academics.

**DR.GUNJAN PATIL**

**ASSISTANT PROFESSOR,**

**DEPARTMENT OF FORESTRY,**

**WILDLIFE AND ENVIRONMENTAL SCIENCES**

**GURU GHASIDA SVISHWAVIDYALAYA**



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गुरु घासीदास विश्वविद्यालय  
(केन्द्रीय विश्वविद्यालय अधिनियम 2009 में 25 के अंतर्गत स्थापित केन्द्रीय विश्वविद्यालय)  
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**DEPARTMENT OF FORESTRY, WILDLIFE AND ENVIRONMENTAL SCIENCES**  
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(A CENTRAL UNIVERSITY ESTABLISHED UNDER CENTRAL UNIVERSITY ACT 2009, No.25 OF 2009)



**(A CENTRAL UNIVERSITY)**

**A**

**Report**

**On**

**“FOREST ATTACHMENT AND INDUSTRIAL TRAINING”**

**SUBMITTED FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENT OF**  
**THE MASTERS DEGREE OF SCIENCE IN FORESTRY**

**ACADEMIC SESSION: 2023-2024**

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**UNDER THE SUPERVISION OF:**

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गुरु घासीदास विश्वविद्यालय  
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**DEPARTMENT OF FORESTRY, WILDLIFE AND ENVIRONMENTAL SCIENCES**  
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I have great pleasure in certifying that Ms. N.Jasmine D/o N.David Raju is a regular student of M.Sc. Forestry 4th Semester (Forest Management) during the session of 2023-24 of Department of Forestry, Wildlife & Environmental Sciences, GGV, Bilaspur, Chhattisgarh. She has completed the **“Forest Attachment and Industrial Training”** for partial fulfillment of the requirement for the degree of masters

I wish her all the success in his future academics.

**DR.GUNJAN PATIL**

**ASSISTANT PROFESSOR,**

**DEPARTMENT OF FORESTRY,**

**WILDLIFE AND ENVIRONMENTAL SCIENCES**

**GURUGHASIDAS VISHWAVIDYALAYA**



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**गुरु घासीदास विश्वविद्यालय**  
(केन्द्रीय विश्वविद्यालय अधिनियम 2009 में 25 के अंतर्गत स्थापित केन्द्रीय विश्वविद्यालय)  
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**Guru Ghasidas Vishwavidyalaya**  
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गुरु घासीदास विश्वविद्यालय  
(केन्द्रीय विश्वविद्यालय अधिनियम 2009 अ. 25 से स्थापित) (केन्द्रीय विश्वविद्यालय)  
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---

**ASSESSMENT OF GERMINATION AND SURVIVAL PERCENTAGE OF  
THE MORINGA OLIFERA VARIETIES  
A DISSERTATION SUBMITTED**



**TO**

**PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE**

**DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES (FOREST  
MANAGEMENT)**

**BY**

**NATASHA BAGHEL**

Enrollment No: GGV/22/06704

**Batch: 2022-24**

UNDER THE SUPERVISION OF

**Dr. CHANDRESH KUMAR SINGH**

Assistant Professor

**DEPARTMENT OF FORESTRY WILDLIFE AND ENVIRONMENTAL SCIENCES**

**SCHOOL OF NATURAL RESOURCES**





**DEPARTMENT OF FORESTRY, WILDLIFE & ENVIRONMENTAL SCIENCE**  
**{ ICFRE A++ }**



**CERTIFICATE**

This is to certify that **Ms. NATASHA BAGHEL** bearing Enrolment number GGV/22/06704 of M.Sc. Forestry IV semester, Department of Forestry, Wildlife and Environmental Sciences, GGV, Bilaspur, has completed his Dissertation entitled “**Assessment of germination and survival percentage of the Moringa olifera varieties**” under my guidance.

I wish her all the success in her future academic endeavors.

**DATE: - 9<sup>th</sup> Sept. 2024**

**PLACE: - BILASPUR, C.G**

**Supervisor**

**Dr. CHANDRESH KUMAR SINGH**

(Assistant professor, Department of  
Forestry, Wildlife and Environmental  
Science)



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**FIELD TRAINING (ATTACHMENT WITH BILASPUR STATE FOREST  
DEPARTMENT)**



**A REPORT SUBMITTED**

**TO**

**PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE**

**DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL  
SCIENCES**

**(FOREST MANAGEMENT)**

**BY**

**NATASHA BAGHEL**

Enrollment No: GGV/22/06704

**Batch: 2022-24**

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**SCHOOL OF NATURAL RESOURCES**



## DEPARTMENT OF FORESTRY, WILDLIFE & ENVIRONMENTAL SCIENCE

{ ICFRE A++ }



This is certified that **Ms. Natasha Baghel**, the student of M.Sc. Forestry & Environmental Science at the Department of Forestry, Wildlife and Environmental Science, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.), has successfully completed the Forest Attachment Training in Bilaspur Forest Division under the supervision of **Dr. CHANDRESH KUMAR SINGH**, Department of Forestry, Wildlife and Environmental Sciences.

During the attachment, Ms. Natasha Baghel actively participated in various forestry and environmental conservation activities, gaining practical insights and hands-on experience in the field. His dedication, enthusiasm, and commitment to learning have been commendable.

We acknowledge his efforts and contribution to the conservation and sustainable management of Forests during the period of attachment.

**Supervisor**

**DATE: - 9<sup>th</sup> Sept. 2024**

**PLACE: - BILASPUR, C.G**

**Dr. CHANDRESH KUMAR SINGH**

(Assistant professor, Department of  
Forestry, Wildlife and Environmental  
Science)



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**INDUSTRIAL TRAINING (MUSHROOM CULTIVATION, VERMICOMPOST AND  
APICULTURE)**



**A REPORT SUBMITTED**

**TO**

**PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE**

**DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL  
SCIENCES**

**(FOREST MANAGEMENT)**

**BY**

**NATASHA BAGHEL**

Enrollment No: GGV/22/06704

**Batch: 2022-24**

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**SCHOOL OF NATURAL RESOURCES**



## DEPARTMENT OF FORESTRY, WILDLIFE & ENVIRONMENTAL SCIENCE

{ ICFRE A++ }



### CERTIFICATE

I have great pleasure in certifying that **Ms. NATASHA BAGHEL** is a regular student of M.Sc. Forestry 4<sup>th</sup> semester during the season of 2023-24 of Department of Forestry, Wildlife and Environmental Sciences. He has completed this report “**REPORT ON APICULTURE, VERMICOMPOST & MUSHROOM PRODUCTION**”. During this semester under my guidance. I wish him all the success in his academics.

Supervisor

DATE: - 9<sup>th</sup> Sept. 2024

PLACE: - BILASPUR, C.G

**Dr. CHANDRESH KUMAR SINGH**

(Assistant professor, Department of  
Forestry, Wildlife and Environmental  
Science)





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2.	VERMICOMPOST
3.	APICULTURE
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5.	CONCLUSION AND REFERENCES



**Assessment of Invasive Flora and their Impact on the Environment of Dalha  
Pahad, Janjgir-Champa, Forest Division, Chhattisgarh, India**

*Dissertation*

Submitted to

**Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh**  
(A Central University)

for the Degree of

**MASTER OF SCIENCE**

in

**FORESTRY AND ENVIRONMENTAL SCIENCES**

**(FOREST MANAGEMENT)**

(School of Natural Resources)



By

**Nishi Xalxo**

M.Sc. Forestry IV Semester

Roll No: 22078112

Enroll No: GGV/18/6120

**Under the Supervision of**

**Dr. Ajay Kumar Singh**

Assistant Professor

Department of Forestry, GGV, Bilaspur

**2024**



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## CERTIFICATE

This is to certify that **Ms. Nishi Xalxo**, D/o **Mr. T. Xalxo**, is a regular student of M.Sc. Forestry IV Semester (FM) during the session of 2023-24 in the Department of Forestry, Wildlife and Environmental Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh. She has completed her dissertation entitled "**Assessment of Invasive Flora and their Impact on the Environment of Dalha Pahad, Janjgir-Champa, Forest Division, Chhattisgarh, India**" under my guidance.

I wish her all the success in her academic endeavors.

**Dr. Ajay Kumar Singh**

Supervisor



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# Report On FOREST AND INDUSTRIAL ATTACHMENT

Submitted to

Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh  
(A Central University)

for the Degree of

**MASTER OF SCIENCE**

in

**FORESTRY AND ENVIRONMENTAL SCIENCES**

**(FOREST MANAGEMENT)**

(School of Natural Resources)



By

**Nishi Xalxo**

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Roll No: 22078112

Enroll No: GGV/18/6120

Under the Supervision of

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Assistant Professor

Department of Forestry, Wildlife & Environmental Sciences  
Guru Ghasidas Vishwavidyalaya

2024



## CERTIFICATE

This is to certify that Ms. Nishi Xalxo, D/o Mr. T. Xalxo, is a regular student of M.Sc. Forestry IV Semester (FM) during the session of 2023-24 in the Department of Forestry, Wildlife and Environmental Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh. She has completed his State forest attachment and Industrial training report under my guidance. I wish her all the success in her academic endeavors.

**Dr. Ajay Kumar Singh**

Supervisor





DEPARTMENT OF FOREST & CLIMATE CHANGE  
Government of Chhattisgarh  
DIVISIONAL FOREST OFFICER, RESEARCH AND  
EXTENSION DIVISION, BILASPUR (C.G.)

**CERTIFICATE**

This is to certify that NISHI XALKO

has successfully completed attachment with office of DFO, Research And Extension  
Division, Bilaspur from 01-05-24 to 30-05-24 He/She has  
demonstrated good Understanding of forestry and ancillary subjects.



Protect Our Forests Preserve Our Future

Shri Abhinav Kumar  
Divisional DFO, RE&ED  
Research Bilaspur (C.G.)  
Bilaspur (C.G.)



INDIRA GANDHI KRISHI VISHWAVIDYALAYA  
**KRISHI VIGYAN KENDRA, BILASPUR (C. G)**

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**Certificate**

This is to certify that Mr./Miss.....*Nishu...*.....  
has successfully completed the Practical training cum Orientation programme on  
**Vermicomposting, Apiculture & Mushroom cultivation** at Krishi Vigyan Kendra,  
Bilaspur during 23<sup>rd</sup> to 31<sup>st</sup> July 2024 (5 Working days).

  
Senior Scientist and Head  
& Co-ordinator  
Senior Scientist & Head  
I.G.K.V. Krishi Vigyan Kendra  
Bilaspur, Bilaspur (C.G.)





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## SUMMARY REPORT OF FOREST ATTACHMENT AND INDUSTRIAL TRAINING



A REPORT SUBMITTED FOR  
PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE  
DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES  
(FOREST MANAGEMENT)

BY

**PRATIBHA SUNANI**

Enrollment No: GGV/22/06705

Roll No : 22078113

Batch: 2022-24

UNDER THE SUPERVISION OF

**Dr. K. K. CHANDRA**

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DEPARTMENT OF FORESTRY WILDLIFE AND ENVIRONMENTAL SCIENCES

(ICFRE A++)

SCHOOL OF NATURAL RESOURCES

GURU GHASIDAS VISHWAVIDYALAYA (NAAC A++)

(A Central University established by the Central Universities Act 2009, NO. 25 of 2009)

**KONI, BILASPUR (C.G) 495009**

**2022-2024**



## CERTIFICATE

This is to certify that Miss Pratibha Sunani, a student of M.Sc. Forestry and Environmental Science at the Department of Forestry, Wildlife, and Environmental Science, Guru Ghasidas Vishwavidyalaya, Bilaspur (Chhattisgarh), has successfully completed her Forest Attachment Training and Industrial Training as part of her academic curriculum.

She completed her Forest Attachment Training at the Bhubaneswar Forest City Division under the supervision of Prof. K.K. Chandra (Head of Department) and the guidance of Mr. Ajit Kumar Satapathy (DFO) and Ms. Swagatika Sahoo (ACF). She actively participated in forestry and conservation activities during this period.

Miss Sunani also completed her Industrial Training in Sericulture and submitted a report titled "Industrial Training Report on Sericulture and Silk Industry. "

Her work has been commendable, and I wish her continued success.

Prof. K.K. Chandra

Head of Department

Department of Forestry, Wildlife, and Environmental Science

Guru Ghasidas Vishwavidyalaya (Central University),

Bilaspur, Chhattisgarh





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## COMMUNITY BASED STRATEGIES FOR CLIMATE CHANGE RESILIENCE AND LIVELIHOOD ENHANCEMENT



A DISSERTATION SUBMITTED FOR  
PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE  
DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES  
(FOREST MANAGEMENT)

BY

**PRATIBHA SUNANI**

Enrollment No: GGV/22/06705

Batch: 2022-24

UNDER THE SUPERVISION OF

**Dr. K. K. CHANDRA**

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(ICFRE A++)

SCHOOL OF NATURAL RESOURCES

GURU GHASIDAS VISHWAVIDYALAYA (NAAC A++)

(A Central University established by the Central Universities Act 2009, NO. 25 of 2009)

**KONI, BILASPUR (C.G) 495009**

**2022-2024**





GURU GHASIDAS VISHWAVIDYALAYA,  
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(A central university established under Central Universities Act 2009, No. 25 of 2009)

**CERTIFICATE**

This is to certify that the dissertation entitled "Community-Based Adaptation Strategies for Climate Change Resilience and Livelihood Enhancement," submitted by Miss Pratibha Sunani in partial fulfillment of the requirements for the award of the degree of Master of Science in Forestry and Environmental Sciences under Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur, Chhattisgarh, is an original research work carried out by her under my supervision.

The research was conducted in collaboration with the Sauta Ganuta Foundation in Keonjhar District, Odisha, and the results presented in this dissertation are entirely original. This work has not been previously submitted, either in part or in full, to any other institution for the award of any degree or diploma.

I extend my best wishes to Miss Pratibha Sunani for her future endeavors.

Prof. K. K. Chandra (Head of  
Department)

Department of Forestry, Wildlife &  
Environmental Sciences



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**TREE DIVERSITY AND ITS CARBON SEQUESTRATION  
POTENTIAL OF DRY DECIDUOUS FOREST IN SINGRAULI FOREST  
DIVISION MADHYA PRADESH, INDIA.**



A DISSERTATION SUBMITTED

TO

PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE

DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES

(FOREST MANAGEMENT)

**BY  
RADHESHYAM BAGHEL**

Enrollment No: GGV/18/6028

Batch: 2023-24

UNDER THE SUPERVISION OF

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SCHOOL OF NATURAL RESOURCES

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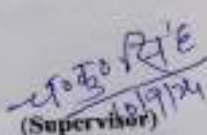
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## CERTIFICATE

This is to certify that the research work embodied in this dissertation entitled **“TREE DIVERSITY AND ITS CARBON SEQUESTRATION POTENTIAL OF DRY DECIDUOUS FOREST IN SINGRAULI FOREST DIVISION MADHYA PRADESH, INDIA”** submitted to Department of Forestry, Wildlife & Environmental Sciences, Guru Ghasidas Vishwavidyalaya, Koni, Bilaspur, Chhattisgarh. for the degree of **MASTER OF SCIENCE IN FORESTRY & ENVIRONMENTAL SCIENCES**, by **RADHESHYAM BAGHEL (Enroll No. GGV/18/6028)**.

I further certified that the research work included in the dissertation is original and has not been submitted in part or full for any other diploma/degree or associate ship at this or any other university/institution.

Date: Place: Bilaspur, Chhattisgarh

  
(Supervisor)



---

## DECLARATION

---

I here by declare that this dissertation work forms the basis of this project **“TREE DIVERSITY AND ITS CARBON SEQUESTRATION POTENTIAL OF DRY DECIDUOUS FOREST IN SINGRAULI FOREST DIVISION MADHYA PRADESH, INDIA”** is an original work carried out by me and has not been submitted anywhere else for the award of any degree.

I also declare that all sources of information and data are fully acknowledged in the Dissertation Report.

**RADHESHYAM BAGHEL**

M.Sc. Forestry, (2023-2024)

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## ACKNOWLEDGEMENT

---

*This study has been made possible by the support of United States Agency for International Development (USAID) for the Strengthening Landscape Management and Conservation (SLMC) project. It was conducted by IORA Ecological Solutions as part of the SLMC project.*

*I would like to thank my mentor, Guide **Dr. Chandresh Kumar Singh** Assistant Professor, Department of Forestry, Wildlife and Environmental Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh, for giving me the guidance, support, encouragement, and valuable time. I would also like to acknowledge my sincere gratitude to Prof. (Dr) **S. C. TIWARI**, (Dean), & Prof. (Dr) **K. K. CHANDRA**, (Head of Department) and All Faculty Members of Forestry, Wildlife and Environmental Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh and for their cooperation, insightful comments, and thoughtful evaluation to carry out this dissertation work I am extremely grateful to **Department of Forestry, Wildlife and environmental sciences** under which this project was completed.*

*Special appreciation goes to **Rishi Kumar, Narendra Sahu, Jyoti Desai, Gaddam Vinay, Jyoti Prakash** for their invaluable contributions. Their involvement significantly enhanced the outcomes of this project.*

*The successful completion of this Dissertation required significant dedication and effort. However, I acknowledge that its accomplishment would not have been possible without the unwavering support and assistance from numerous individuals and organizations.*

*Lastly, I extend my heartfelt thanks to my friends and family who have provided unwavering support and encouragement throughout the journey of completing this project. Their presence has been a constant source of motivation.*



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## REPORT ON FOREST ATTACHMENT AND INDUSTRIAL TRAINING



A REPORT SUBMITTED TO

PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE

DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES

(FOREST MANAGEMENT)

BY

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## CERTIFICATE

I have great pleasure in certifying that **Mr. RADHESHYAM BAGHEL S/o Mr PILADAS BAGHEL** is a regular student of M.Sc. Forestry during the session of 2023-24 of Department of Forestry, Wildlife & Environmental Sciences, Guru Ghasidas Vishwavidyalaya, Koni, Bilaspur, Chhattisgarh. He has completed the **Forest Attachment and Industrial Training** during this semester under my supervision.

I wish him all the success in his career.

Date: Place: Bilaspur, Chhattisgarh

चंद्रेश कुमार सिंह  
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## ***DECLARATION***

*I hereby declare that the project work entitled "Training report on Field Training (Forest Attachment & Industrial Attachment) submitted to the Department of Forestry, Wildlife and Environmental Sciences, Guru Ghasidas Vishwavidyalaya. This is a record of an original work done by me under the guidance of Dr. Chandresh Kumar Singh, Assistant Professor and this project work has been performed for the award of Master's degree in Forestry and Environmental Sciences.*

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## ACKNOWLEDGEMENT

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*This study has been made possible by the support of IORA Ecological Solutions as part of the SLMC project and Bilaspur Forest Division & IGKV, Krishi Vigyan Kendra, Bilaspur (C.G).*

*I would like to thank my mentor, Guide Dr. **Chandresh Kumar Singh** Assistant Professor, Department of Forestry, Wildlife and Environmental Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh, for giving me the guidance, support, encouragement, and valuable time. I would also like to acknowledge my sincere gratitude to Prof. (Dr) **S. C. TIWARI**, (Dean), & Prof. (Dr) **K. K. CHANDRA**, (Head of Department) and All Faculty Members of Forestry, Wildlife and Environmental Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh and for their cooperation, insightful comments, and thoughtful evaluation to carry out this Report I am extremely grateful to **Department of Forestry, Wildlife and environmental sciences** under which this project was completed.*

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RADHESHYAM BAGHEL



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**Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)**

**(A Central university established under Central Universities Act 2009, No 25 of 2009)**

**DISSERTATION**

**ON**

**Biomass of Miyawaki Plantation in Seepat, Bilaspur, (C.G.)**



**(SUBJECT- Forest Management)**

**(Academic Session-2023-2024)**

**SUBMITTED TO**

**Prof. K.K. Chandra**

**(Head of Department)**

**(Department of Forestry Wildlife**

**& Environmental science)**

**SUBMITTED BY**

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This is to certify that this report entitled “**Biomass of Miyawaki plantation in Seepat, Bilaspur, Chhattisgarh**”. Submitted by Ritu Maravi in partial fulfillment and of the requirement of the award of the degree of master of science in (Forestry and Environmental science) under Guru Ghasidas Vishwavidyalaya Bilaspur Chhattisgarh, is the outcome of an original research work carried out by her under my supervision. the work has been carried out in Department of Forestry & Environmental Science and the results embodied in this report is original and have not been previously submitted either in part or full to any other institution for the award of any degree or diploma.

I wish him all success in his future endeavors.

A handwritten signature in black ink, appearing to be "K.K Chandra", written over a light blue rectangular background.

**Supervisor**

Prof. K.K Chandra

(Head of Department)

Forestry, Wildlife and

Environmental Science

Guru Ghasidas Vishwavidyalaya

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C.G.



### Declaration

I, Ritu Maravi (M.Sc. Forestry & Environmental Science Enroll. No. GGV/18/6141, do hereby declare that this report entitled “Biomass of Miyawaki plantation in Seepat, Bilaspur, Chhattisgarh” is a result of the original work carried out by me under the kind supervision of prof. K.K Chandra (Head of Department), Guru Ghasidas Vishwavidyalaya, Bilaspur Chhattisgarh, as a part of the award of the degree of Master of science in Forestry & Environmental Sciences. To the best of my knowledge, it contains no material previously published or written by another person and that which is presented in form of citations, have been duly acknowledged in the “References” section. I have acknowledged all the agencies and persons concerned who have directly or indirectly assisted me during the sampling, processing, analysing and preparation of this report.

I am fully aware while I declared that this report has not been previously submitted to this university or any other institution for the award of any other degree or diploma.

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### **Acknowledgment**

I am grateful to all those with whom I have had the pleasure to work during this projects each of the members of my dissertation committee has provided me extensive personal and professional guidance and taught me a great deal about both certificate Research and life in general. I would special like to thank Prof. K.K Chandra, Head of department. As my teacher and mentor, he has taught me more than I could ever give him credit for here. He has shown me, why his example. What a good student should be. Nobody has been more important to me in the pursuit of this project then the members of my family. I would like to thank my parents, whose love and guidance are with me in whatever I pursue. They are the ultimate role models. Most importantly, I wish to thank my loving and supportive coordinator prof. Dr. Chandresh kumar Singh and my loving friends, who provide an ending inspiration in compilation of this project.



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**Report**  
**ON**  
**FOREST ATTACHMENT**



**(SUBJECT- Forest Management)**

**(Academic Session-2023-2024)**

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I wish him all success in his future endeavors.

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## **INDUSTRIAL TRAINING**

**ON**

**Mushroom cultivation, Apiculture, Vermicompost,  
Bilaspur, (C.G.)**



**(SUBJECT- Forest Management)**

**(Academic Session-2023-2024)**

**SUBMITTED TO**

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I wish him all success in his future endeavors

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A COMPARATIVE STUDY OF BIOSORBENT; NEEM LEAVES POWDER AND KARANJ  
LEAVES POWDER FOR REMOVAL OF Cr(VI) BY BATCH ADSORPTION METHOD.



A DISSERTATION SUBMITTED FOR  
PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE  
DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES  
(FOREST MANAGEMENT)

BY

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**2024**



Department of Forestry, Wildlife and Environmental Sciences  
**Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)**  
(A Central University established under Central University Act 2009, No.25 of 2009)



**CERTIFICATE**

This is to certify that the Dissertation entitled “**A Comparative Study of biosorbent; Neem Leaves Powder and Karanj Leaves Powder for Removal of Cr(VI) By Batch Adsorption Method**” submitted in partial fulfilment of the requirements for the Degree of **Master of Science in Forestry and Environmental Sciences** in Department of Forestry, Wildlife & Environmental Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur (Chhattisgarh) is the work carried out by **Mr. Sahid Abdul Sathar S/o Mr. Abdul Sathar K. P.** under my supervision and guidance

I wish him all the success in his academics

Date: 09/09/2024

Place: Bilaspur

**Dr. Brijendra Pratap Singh**  
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Assistant Professor of  
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## ABSTRACT

Much attention has been made towards adsorbent materials to be used in heavy metal removal from polluted water and various techniques are applied such as chemical, physical and biological techniques. This study was designed for using less expensive and much frequently available materials (Neem leaves powder and Karanj leaves powder) to remove Cr (VI) from water. Batch adsorption study has performed, analysis done by UV- spectrophotometer. The adsorbate of 50 ppm, 75 ppm and 100 ppm treated with adsorbent dose 2 g/l, 4g/l and 6 g/l, for 1 hour of contact time in Neem 75 ppm at 6 g/l show more removal efficiency percentage 32.58. Current data show that Neem leaves powder adsorbents used are capable of removing Cr (VI) ions at significant adsorption capacity and removal efficiency, as in Karanj leaves powder did not show remarkable adsorption efficiency.

**Keywords:** Heavy metal Cr (VI), Adsorption, Removal Efficiency, Adsorbent size.





FIELD TRAINING (ATTACHMENT WITH KERALA STATE FOREST DEPARTMENT)



A REPORT SUBMITTED FOR  
PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE  
DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES  
(FOREST MANAGEMENT)

BY

**SAHID ABDUL SATHAR**

Enrollment No: GGV/22/ 06706

Batch: 2022-24

UNDER THE SUPERVISION OF

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Assistant Professor

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(A Central University established by the Central Universities Act 2009, NO. 25 of 2009)

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**2024**



**Department of Forestry, Wildlife and Environmental Sciences**  
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## INDUSTRIAL TRAINING (BEE KEEPING AND HONEY PROCESSING)



A REPORT SUBMITTED FOR  
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## **RHIZOSPHERE SOIL PROPERTIES OF ACACIA NILOTICA PLANTATION.**



A DISSERTATION SUBMITTED FOR  
PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE  
DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES  
(FOREST MANAGEMENT)

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## ABSTRACT

This study explores the rhizosphere soil properties of *Acacia nilotica* plantations, with a focus on comparing the rhizosphere soil and bulk soil collected from various locations on the GGV campus. Key soil parameters, including pH, moisture content, soil organic carbon (SOC), cation exchange capacity (CEC), and nutrient concentrations (calcium, sodium, phosphorus, and potassium), were analyzed to assess differences between the rhizosphere and bulk soil environments. The study reveals that the rhizosphere soil of *Acacia nilotica* exhibits a more acidic pH and higher moisture content compared to bulk soil, which suggests more active root-soil interactions. Additionally, elevated levels of SOC, phosphorus, potassium, and calcium in the rhizosphere indicate enhanced biological activity and nutrient cycling. However, the higher sodium content in the rhizosphere raises concerns about potential soil salinization. The rhizosphere also shows a higher CEC, attributed to root-mediated processes that improve nutrient retention and soil fertility. The findings emphasize the significant influence of *Acacia nilotica* on the rhizosphere, enhancing soil properties and nutrient availability. This has important implications for soil management, plant nutrition, and ecosystem restoration. Further research is recommended to understand the long-term effects of *Acacia nilotica* on soil health and its potential role in sustainable land management practices.

**Keywords:** Rhizosphere soil, *Acacia nilotica*, soil properties, nutrients.



**FIELD TRAINING (ATTACHMENT WITH KERALA STATE FOREST DEPARTMENT)**



A REPORT SUBMITTED FOR  
PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE  
DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES  
(FOREST MANAGEMENT)

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## INDUSTRIAL TRAINING (BEE KEEPING AND HONEY PROCESSING)



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**Assistant Professor of**  
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**Comparative Assessment of Stand Characteristics/Soil Nutrient and Biomass Accumulation in Pure Eucalyptus Plantation & Mixed Plantation Sites under Durg Forest Division.**



A DISSERTATION SUBMITTED TO  
PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF  
MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES  
(SPECIALIZATION IN FOREST MANAGEMENT)

BY  
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*I wish Sanjeeta Dwivedi all the success in her academics.*

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Date : September 2024



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# **GURU GHASIDAS VISHWAVIDYALAYA BILASPUR (C.G.)**

## **DEPARTMENT OF FORESTRY, WILDLIFE & ENVIRONMENTAL SCIENCES**

**(Session: 2022-24)**



**A Report on**

**ATTACHMENT WITH STATE FOREST DEPARTMENT, DURG FOREST CIRCLE**

**(Balod Forest Division & Durg Forest Division)**

**Submitted for partial fulfilment of the requirement for the Degree of  
Master of Science In Forestry, Wildlife and Environmental Sciences.**

**Under the Supervision of:**

**Dr. Bhavana Dixit**

Assistant Professor  
Department of Forestry, Wildlife  
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**Submitted By:**

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M.Sc. Forestry 4<sup>th</sup> Sem.  
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(A central university established under Central Universities Act 2009, No. 25 of 2009)



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*This is to certify that the Student report entitled “**State Forest Attachment with Balod Forest division & Durg Forest Division**” submitted in partial fulfilment of the requirements for the Degree of Master of Science in Forestry and Environmental Sciences in Department of Forestry, Wildlife & Environmental Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur (Chhattisgarh) is the work carried out by **Ms. Sanjeeta Dwivedi** D/o Mr. Pankaj Dwivedi under my supervision and guidance.*

**Place: Bilaspur**

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**DEPARTMENT OF FORESTRY, WILDLIFE & ENVIRONMENTAL  
SCIENCES**

**Session-2022-24**

**A report on INDUSTRIAL TRAINING**

submitted as a part of fulfilment of Master's degree in Forestry & Environmental Sciences.

**Bhilai Steel Plant and Mahua Processing Unit, Rajnandgaon**

**Under the Supervision of**

**Dr. BHAVANA DIXIT**

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**Guru Ghasidas Vishwavidyalaya**  
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---



A

DESSERTATION

ON

**“Documentation and Collection of Non-Timber Forest Products and Its impact on  
Livelihood of Tribals in Raigarh Forest Division of Chhattisgarh”**



A DISSERTATION SUBMITTED

TO

PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE

DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES

(FOREST MANAGEMENT)

Session: 2023-24

BY

SOMLATA PATEL

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UNDER THE SUPERVISION OF

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**DEPARTMENT OF FORESTRY WILDLIFE AND ENVIRONMENTAL SCIENCES**

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Supervisor

Dr. Bhavna Dixit

(Assistant Professor)

Forestry, Wildlife and

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**Field Training Attachment with state forest department for  
understanding of forest operations and Management practices,  
Raigarh Chhattisgarh**



A REPORT

SUBMITTED TO

**PARTIAL FULFILLMENT FOR THE REQUIREMENT OF  
DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES  
(SPECIALIZATION IN FOREST MANAGEMENT)**

**BY**

**SOMLATA PATEL**

Enrolment No: GGV/22/06710

ROLL NO - **22078120**

Batch: 2023-24

UNDER THE SUPERVISION OF

**Dr. Bhavna Dixit**

Assistant Professor

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(Accredited 'A++' Grade (2023) by ICFRE, Dehradun, GOI)  
SCHOOL OF NATURAL RESOURCES

**GURU GHASIDAS VISHWAVIDYALAYA**

(Accredited A<sup>++</sup> by NAAC)

(A Central University established by the Central Universities Act 2009, NO. 25 of 2009)

**KONI, BILASPUR (C.G) 495009**





2024

**Guru Ghasidas Vishwavidyalaya, Bilaspur (CG)**



(A central University established under Central University Act 2009, No. 25 of 2009)

**CERTIFICATE**

This is to certify that this report entitled "Forest attachment under Raigarh forest division and industrial training at BEMETARA (CG)". Submitted by SOMLATA PATEL in partial fulfilment and of the requirement of the award of the degree of master of science in (Forestry and Environmental science) under Guru Ghasidas Vishwavidyalaya Bilaspur Chhattisgarh, is the outcome of an original research work carried out by her under my supervision, the work has been carried out in Department of Forestry & Environmental Science and the results embodied in this report is original and have not been previously submitted either in part or full to any other institution for the award of any degree or diplomas

I wish her all success in her future endeavours,

**Supervisor**

Dr. Bhavna Dixit (Assistant Professor)  
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## **NUTRIENT STATUS OF SAL AND TEAK FOREST OF BANKURA DISTRICT, WEST BENGAL**



**A DISSERTATION SUBMITTED**

**TO**

**PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE**

**DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES**

**(FOREST MANAGEMENT)**

**BY**

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## DEPARTMENT OF FORESTRY, WILDLIFE & ENVIRONMENTAL SCIENCE

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I wish her all the success in her future academic endeavours.

**DATE: - 9<sup>th</sup> Sept. 2024**

**PLACE: - BILASPUR, C.G**

**Supervisor**

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## Abstract

A study was conducted to estimate the nutrient status of soil under Sal (*Shorea robusta*) and Teak (*Tectona grandis*) plantations in Bankura district, West Bengal, India. Soil samples were collected from each forest type and analyzed for key properties, including pH, electrical conductivity (EC), organic carbon (OC), nitrogen (N), phosphorus (P), and potassium (K). This study evaluated the nutrient status of soils in Sal (*Shorea robusta*) and Teak (*Tectona grandis*) forest plantations, comparing them with open ground and with each other. The results showed the nutrient status of the different land use systems in the district. The Sal Forest soil exhibited a pH of 4.0, moderate EC (0.16 dS/m), and higher levels of organic carbon (0.51%) and nitrogen (222.46 kg/ha), resulting in medium fertility ratings for both OC and N. Phosphorus and potassium levels were moderate (12.30 kg/ha and 117.7 kg/ha, respectively), with medium and low fertility ratings, respectively. Teak plantation soil showed a slightly higher pH (4.66) and lower EC (0.13 dS/m) compared to Sal Forest, with organic carbon at 0.48% and nitrogen at 207.8 kg/ha, both rated as low to medium in fertility. Phosphorus (10.56 kg/ha) and potassium (114.63 kg/ha) levels were lower than in the Sal Forest, reflecting low fertility ratings for phosphorus and medium for potassium. The open ground exhibited the lowest pH (3.87) and EC (0.11 dS/m) with lower organic carbon (0.46%) and nitrogen (205.3 kg/ha), leading to low fertility ratings. Phosphorus (13.6 kg/ha) and potassium (121.1 kg/ha) levels were rated as medium and low, respectively. These results indicated that the differences were due to high organic matter content, continuous leaf litter deposition and decomposition, lower ion content and salinity,  $\text{NH}_3$  volatilization, nitrification, denitrification, and improper management of the soil. The nutrient status of the soils in the Sal and Teak Forest plantations revealed distinct differences in nutrient dynamics influenced by vegetation type and land management practices. The study highlighted the need for different management strategies useful to the specific nutrient dynamics of each land use system to maintain soil fertility and promote sustainable forest productivity.

**Keywords:** Nutrient Status, *Shorea robusta*, *Tectona grandis*, Soil fertility index.



**FIELD TRAINING (ATTACHMENT WITH WEST BENGAL STATE FOREST  
DEPARTMENT)**



**A REPORT SUBMITTED**

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**(FOREST MANAGEMENT)**

**BY**

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During the attachment, Mr. Sourav Sinha mahapatra actively participated in various forestry and environmental conservation activities, gaining practical insights and hands-on experience in the field. His dedication, enthusiasm, and commitment to learning have been commendable.

We acknowledge his efforts and contribution to the conservation and sustainable management of Forests during the period of attachment.

**DATE: - 9<sup>th</sup> Sept. 2024**

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**INDUSTRIAL TRAINING (MUSHROOM CULTIVATION, VERMICOMPOST AND  
APICULTURE)**



**A REPORT SUBMITTED**

**TO**

**PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE**

**DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL  
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**(FOREST MANAGEMENT)**

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I have great pleasure in certifying that **Mr. SOURAV SINHA MAHAPATRA** is a regular student of M.Sc. Forestry 4<sup>th</sup> semester during the season of 2023-24 of Department of Forestry, Wildlife and Environmental Sciences. He has completed this report “**REPORT ON APICULTURE, VERMICOMPOST & MUSHROOM PRODUCTION**”. During this semester under my guidance. I wish him all the success in his academics.

**DATE: - 9<sup>th</sup> Sept. 2024**

**PLACE: - BILASPUR, C.G**

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**DEPARTMENT OF FORESTRY, WILDLIFE AND ENVIRONMENTAL SCIENCES**

**GURU GHASIDAS VISHWAVIDYALAYA, KONI, BILASPUR, CHHATTISGARH**

(A CENTRAL UNIVERSITY ESTABLISHED UNDER CENTRAL UNIVERSITY ACT 2009, No.25 Of 2009)

**(A CENTRAL UNIVERSITY)**

**A**

**DISSERTATION**

**On**

**“A COMPARATIVE STUDY ON FUELWOOD CONSUMPTION BY RURAL HOUSEHOLDS  
BETWEEN TWO VILLAGE IN BANKURA DISTRICT, WEST BENGAL”**

**SUBMITTED FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENT OF  
THE MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES**

**(FOREST MANAGEMENT)**

**BATCH : 2022-2024**



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This is certified that Mr. Suman Sinha Mahapatra, the student of M.Sc. Forestry & Environmental Science at the Department of Forestry, Wildlife and Environmental Science, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.), has successfully completed the Forest Attachment Training in Kharagpur & Midnapore Forest Division under the supervision of Dr. S. S. Dhuria, Department of Forestry, Wildlife and Environmental Science, And Mr. Kamal Sarkar, Director, Hijli Forest Training Institute, Kharagpur, West Bengal.

During the attachment, Mr. Suman Sinha mahapatra actively participated in various forestry and environmental conservation activities, gaining practical insights and hands-on experience in the field. His dedication, enthusiasm, and commitment to learning have been commendable.

We acknowledge his efforts and contribution to the conservation and sustainable management of Forests during the period of attachment.

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**CERTIFICATE**

This is to certify that the student report entitled “*Industrial Training Report*” submitted in partial fulfillment of the requirements for *the Degree of Master of Science in Forestry to the Department of Forestry, Wildlife & Environmental Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur (Chhattisgarh)*. This report is the genuine record of the bonafide carried out by **Mr. Suman Sinha Mahapatra** under my supervision and guidance. His work was appreciable and satisfactory.

I wish him all the success in his future academic endeavors.

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Department of Forestry, Wildlife  
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(A CENTRAL UNIVERSITY ESTABLISHED UNDER CENTRAL UNIVERSITY ACT 2009, No.25 OF 2009)

**(A CENTRAL UNIVERSITY)**

**A**

**DISSERTATION**

**On**

**“Biomass and Carbon Stocks of Teak Plantation in Biodiversity Park, Talpuri, Durg (C.G.)”**

**SUBMITTED FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENT OF**

**THE MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES**

**(FOREST MANAGEMENT)**

**BATCH : 2022-2024**



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**On**

**FOREST ATTACHMENT**

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**THE MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES**

**(FOREST MANAGEMENT)**

**BATCH : 2022-2024**



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We acknowledge her efforts and contribution to the conservation and sustainable management of Forests during the period of attachment.

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**Dr. S. S. Dhuria**

**(Supervisor)**

Department of Forestry, Wildlife  
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Guru Ghasidas Vishwavidyalaya,  
Bilaspur C.G



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**DEPARTMENT OF FORESTRY, WILDLIFE AND ENVIRONMENTAL SCIENCES**

**GURU GHASIDAS VISHWAVIDYALAYA, KONI, BILASPUR, CHHATTISGARH**

(A CENTRAL UNIVERSITY ESTABLISHED UNDER CENTRAL UNIVERSITY ACT 2009, No.25 OF 2009)

**(A CENTRAL UNIVERSITY)**

**A**

**REPORT**

**On**

**“INDUSTRIAL TRAINING (MUSHROOM CULTIVATION, VERMICOMPOST AND APICULTURE)”**

**SUBMITTED FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENT OF**

**THE MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES**

**(FOREST MANAGEMENT)**

**BATCH : 2022-2024**



**SUBMITTED BY-**

**Vaishnavi Awasaria**

M.SC FORESTRY AND ENVIRONMENTAL SCIENCES (4<sup>TH</sup> SEM)

ROLL NO- 22078123

Enrollment No: GGV/18/6167

**UNDER THE SUPERVISION OF-**

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PROFESSOR

DEPARTMENT OF FORESTRY, WILDLIFE AND

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GGV, BILASPUR, C.G



**Department of Forestry, Wildlife & Environmental Science**  
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**(A Central University Establishment under Central University Act 2009, No.25 of 2009)**



**CERTIFICATE**

This is to certify that the student report entitled ***“Industrial Training Report”*** submitted in partial fulfillment of the requirements for ***the Degree of Master of Science in Forestry to the Department of Forestry, Wildlife & Environmental Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur (Chhattisgarh)***. This report is the genuine record of the bonafide carried out by **Vaishnavi Awasaria** under my supervision and guidance. His work was appreciable and satisfactory.

I wish him all the success in his future academic endeavors.

A handwritten signature in blue ink, appearing to be 'S. S. Dhuria', is placed over a light gray rectangular background.

**Dr. S. S. Dhuria**  
**(Supervisor)**

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*Dissertation on*

FINE ROOTS AND RHIZOSPHERE SOIL CHARACTERISTICS OF TEAK PLANTATION IN  
BILASPUR CHHATTISGARH

*Submitted to*

Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh  
(A Central University)

For the partial fulfillment of the requirement for the degree of Master of Science in Forestry and  
Environmental Sciences  
(Forest Management)



By

**VIKASH**

M.Sc Forestry 4<sup>th</sup> semester

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**KONI, BILASPUR (C.G) 495009**

**2024**



### **CERTIFICATE-1**

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I wish him all the success in his future academics.

**Dr. Chowhani Manpoong**

Supervisor

Dept. of Forestry, Wildlife and  
Environmental science, GGV, Bilaspur



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A Report  
On  
Forest Attachment and Industrial training  
In Bilaspur Forest Division  
*Submitted to*  
Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh  
(A Central University)  
For the partial fulfillment of the requirement for the degree of Master of Science in Forestry and  
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**Dr. Chowhani Manpoong**

Supervisor

Dept. of Forestry, Wildlife and  
Environmental science, GGV, Bilaspur

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**A**  
**Dissertation On “Production of Lac”**



**A DISSERTATION SUBMITTED**

**TO**

**PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE**

**DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL SCIENCES (FOREST**

**MANAGEMENT)**

**BY**

**YASHASWI GUPTA**

Enrollment No: GGV/17/6097

**Batch: 2022-24**

**UNDER THE SUPERVISION OF**

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**DEPARTMENT OF FORESTRY, WILDLIFE & ENVIRONMENTAL SCIENCE**  
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**CERTIFICATE**

This is to certify that **Mr. YASHASWI GUPTA** bearing Enrolment number GGV/17/6097 of M.Sc. Forestry IV semester, Department of Forestry, Wildlife and Environmental Sciences, GGV, Bilaspur, has completed his Dissertation entitled “**Production of Lac**” under my guidance.

I wish her all the success in her future academic endeavours.

**DATE: - 9<sup>th</sup> Sept. 2024**

**PLACE: - BILASPUR, C.G**

**Supervisor**

**Dr. GARIMA TIWARI**

(Assistant professor, Department of  
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**FIELD TRAINING (ATTACHMENT WITH BILASPUR STATE FOREST  
DEPARTMENT)**



**A REPORT SUBMITTED**

**TO**

**PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE**

**DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL  
SCIENCES**

**(FOREST MANAGEMENT)**

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This is certified that **Mr. Yashaswi Gupta**, the student of M.Sc. Forestry & Environmental Science at the Department of Forestry, Wildlife and Environmental Science, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.), has successfully completed the Forest Attachment Training in Bilaspur Forest Division under the supervision of **Dr. Garima Tiwari**, Department of Forestry, Wildlife and Environmental Sciences.

During the attachment, Mr. Yashaswi Gupta actively participated in various forestry and environmental conservation activities, gaining practical insights and hands-on experience in the field. His dedication, enthusiasm, and commitment to learning have been commendable.

We acknowledge his efforts and contribution to the conservation and sustainable management of Forests during the period of attachment.

**Supervisor**

**Dr. Garima Tiwari**

(Assistant professor, Department of  
Forestry, Wildlife and Environmental Science)

**DATE: - 9<sup>th</sup> Sept. 2024**

**PLACE: - BILASPUR, C.G**



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	Honey
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<b>Chapter – 10</b>	PARIVESH E-GREEN watch portal
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गुरु घासीदास विश्वविद्यालय  
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**INDUSTRIAL TRAINING (MUSHROOM CULTIVATION, VERMICOMPOST AND  
APICULTURE)**



**A REPORT SUBMITTED**

**TO**

**PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE**

**DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL  
SCIENCES**

**(FOREST MANAGEMENT)**

**BY**

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Supervisor

**Dr. Garima Tiwari**

(Assistant professor, Department of  
Forestry, Wildlife and Environmental Science)

**DATE: - 9<sup>th</sup> Sept. 2024**

**PLACE: - BILASPUR, C.G**



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2.	VERMICOMPOST
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4.	PHOTO PLATES
5.	CONCLUSION AND REFERENCES



2024



## DEPARTMENT OF FORESTRY, WILDLIFE & ENVIRONMENTAL SCIENCE

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I wish her all the success in her future academic endeavours.

DATE: - 9<sup>th</sup> Sept. 2024

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Supervisor

**Dr. ATUL KUMAR BHARADWAJ**

(Assistant professor, Department of  
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## Abstract

*Limonia acidissima* (Kaitha) is a big tree that can grow to 9 meters (30 feet) tall and has rough, prickly bark. The leaves are pinnate, with 5-7 leaflets, each 25-35 mm long and 10-20 mm wide, and have a citrus aroma when crushed. This study was carried out for 8 months (December 2023 to July 2024) at the Forest Nursery in Guru Ghasidas University, Bilaspur. This study's instruments and tools comprised a hoe, sickle, polythene bag, Vernier callipers, scissors, and plastic rope NPK fertilizer (19:19:19). This study examined the impact of various NPK fertilizer doses on the growth of *Limonia acidissima*. Bilaspur is a city in the state of Chhattisgarh, India. It is located in the centre of the country and has a subtropical climate. The study site is located between 22°12'6602" N latitude and 82°13'7479" longitude. The average annual rainfall in Bilaspur, Chhattisgarh, is from 1,100 to 1,500 millimetres (43 to 59 inches). The average temperature in April is between 22°C (72°F) and 36°C (97°F). Generally, plant growth was affected significantly by NPK levels. Although in the first observation, the plant height was not influenced by NPK treatment. The significant effect of NPK to plant height was obtained in the last observation, after the early generative stage of the plant. The highest plant obtained from treatment T4 11.5gm per plant. Another researcher cited the same result that plant height significantly increased with an increase in NPK levels. The stem diameter was affected considerably by NPK levels. The biggest stem was gained from treatment T3 0.75gm per plant NPK levels. The other observation showed that the total leaves were also significantly affected by NPK levels. The most number of leaves obtained from treatment T3 and T4 0.75gm/plant, 11.5gm/ plant NPK. Based on these statistics, it can be concluded that T4 11.5gm/plant treatment performed the best overall, exhibiting high growth percentage, fast growing this dose for recommended for wood apple, T3 75.5gm/plant treatment also showed promising results in terms of growth. The organic group is good but treatments are better than organic in all measured parameters. In case of wood apple, the highest growth percentage observed is 80% for T4 11.5gm/Plant NPK Treatment, while the lowest is the 30% T5 15.5gm/plant NPK for the control. This indicates that the T4 11.5gm/plant NPK Treatment had the most favourable effect on growth of plant (cm).

**Keywords:** NPK Fertilizer, Growth Parameters, *Limonia acidissima*.



**FIELD TRAINING (ATTACHMENT WITH RAIGARH DIVISION  
CHHATTISGARH STATE FOREST DEPARTMENT)**



**A REPORT SUBMITTED**

**TO**

**PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE**

**DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL  
SCIENCES**

**(FOREST MANAGEMENT)**

**BY**

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## DEPARTMENT OF FORESTRY, WILDLIFE & ENVIRONMENTAL SCIENCE

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During the attachment, YOGITA KAUSHAL actively participated in various forestry and environmental conservation activities, gaining practical insights and hands-on experience in the field. Her dedication, enthusiasm, and commitment to learning have been commendable.

We acknowledge her efforts and contribution to the conservation and sustainable management of Forests during the period of attachment.

**DATE: - 9<sup>th</sup> Sept. 2024**

**PLACE: - BILASPUR, C.G**

**Supervisor**

**Dr. Atul Kumar Bharadwaj**

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**INDUSTRIAL TRAINING (MUSHROOM CULTIVATION, VERMICOMPOST AND  
APICULTURE)**



**A REPORT SUBMITTED**

**TO**

**PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE**

**DEGREE OF MASTER OF SCIENCE IN FORESTRY AND ENVIRONMENTAL  
SCIENCES**

**(FOREST MANAGEMENT)**

**BY**

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**DATE: - 9<sup>th</sup> Sept. 2024**

**PLACE: - BILASPUR, C.G**

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