



Marathwada Shikshan Prasarak Mandal's

Sunderrao Solanke Mahavidyalaya, Majalgaon



INTERNAL QUALITY ASSURANCE CELL

CRITERION-6: GOVERNANCE, LEADERSHIP AND MANAGEMENT

6.3 Faculty Empowerment Strategies

6.3.1 The institution has effective welfare measures and Performance Appraisal System for teaching and non-teaching staff

Sample PBAS 2021-2022

M.S.P. Mandal's
Sunderrao Solanke Mahavidyalaya, Majalgaon, Dist. Beed
ANNUAL SELF- ASSESSMENT REPORT
ACADEMIC YEAR- 2021-2022

PART A : GENERAL INFORMATION AND ACADEMIC BACKGROUND

1. Name (in Block Letters) :- **Dr. SALUNKHE INDRARAO BHAURAO**
2. Father's Name / Mother's Name :- **SHRI. SALUNKHE BHAURAO SHANKARRAO**
3. Department :- **BOTONY**
4. Current Designation Grad Pay :- **Associate Professor**
A.G.P. 9000/-
5. Date of last Promotion :- **24/07/2019**
6. For which position and grade you are applying under CAS?
:- **Revised Academic level 13A to 14**

Professor, Stage 5 Academic Level 14144200-2018200

7. Date of eligibility for promotion :- **24-07-2022**
8. Date and Place of Birth :- **17/12/1967**

At.Po.Undirkheda Tq. Parola Dist. Jalgaon

9. Sex :- **Male** **Female**

10. Marital status :- **Married** **Unmarried**

Nationality :- **Indian**

- 12 . Category tick (√) in the appropriate box

S.C	S.T.	D.T. (A)	N.T. (B)	N.T. (C)	N.T. (D)	O.B.C.	S.B.C.	Open
						√		

PART B: ACADEMIC PERFORMANCE INDICATORS

BRIEF NOTE: Based on the teacher's self-assessment, Grading criteria and Scores and or publications. The minimum Grading criteria and scores and or publications required by teachers from this category is different for different levels of promotion. The self- assessment grades, scores and or publications should be based on objectively verifiable records. It shall be finalized by the screening cum evaluation / selection committee. Universities may detail the activities, in case institutional specificities require, adjust the weightage without changing the minimum total scores required.

**TABLE 1:
Assessment Criteria and Methodology for University/College Teachers**

1. TEACHING RELATED ACTIVITIES, DOMIAN KNOWLEDGE:

Sl. No	Name of activity or Mode of Teaching	Unit of Calculation		Self Appraisal grading	Verified by the Committee
		Actual Classes spent per year	% of Teaching		
1	Black Board	100	100%	Good	Good
2	ICT based	20	50%		
3	Practical, Laboratory	250	100%		
4	Tutorial/ Assignments/ Projects	60	---		
5	Field work	10	100%		
6	Group discussion	10			
7	Seminar	10			
8	Remedial Teaching				
9	Clarifying doubts within and outside the class hours	20			
10	Additional teaching to support counselling and mentoring	50			
	Total	560	90%	Good	Good

2. INVOLVEMENT IN THE UNIVERSITY STUDENTS RELATED ACTIVITIES / RESEARCH ACTIVITIES:

Sl. No	Activity	Specify actual participation in year	Total days spent per year	Self-Appraisal Grading for Professor	Verified API Grading by Committee

	Ph.D students. i. No. of registered candidate ii. No. of awarded candidate			Good	
	f. Conducting minor or major research project sponsored by national or international agencies. i. Above 10 Lacs ii. Below 10 Lacs	---	---		
	g. At least one single or joint publication in peer reviewed or UGC list of Journals. i. No. of paper Published (Single Author) ii. No. of Paper Published (Joint Author)	04	15 Days		
Overall Grading				Good	

* Should be claimed by the applicant with supporting documents

Table: 2. Research and Academic Contribution

1. Research Papers in peer-Review or UGC listed Journals (Please refer points as per UGC notification).

S. No.	Title of Paper	Journal Name, page nos., Vol. No., year of Publication	ISSN/ ISBN No	Impact Factor if any (with if agency)	No. of co-authors	Whether Principal Author /Supervisor /Co-supervisor	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
1.	Preliminary Survey on timber yielding plants of Yawal-Pal wildlife sanctuary and its adjacent area in Southern Satpuda Ranges from Jalgaon District(M.S.)	An International Journal of emerging technologies and innovative research (JETIR) Volume-8 Issue-9 Sep-2021 e-295-298	ISSN: 2349-5162	7.95,	02	Principal Author	9.1		
2.	Ethnobotanical report on some wild edible fruits of Beed districts of Maharashtra.	International Journal of scientific research in science and technology . Volume-9 Issue-9 May-2022 96-104	ISSN: 2395-602X	7.214	01	Principal Author	9.1		
3.	Soyabean Response to biological and chemical fertilizers	International Journal of scientific research in science and technology . Volume-9 Issue-9 May-2022 158-162	ISSN: 2395-602X	7.214	02	Principal Author	9.1		
4.	Comparative , quantitative HPTLC Analysis of Solasodine from in vivo and in vitro leaf sample of solanum virginianum L.	International Journal of scientific research in science and technology . Volume-9 Issue-9 May-2022 192-196	ISSN: 2395-602X	7.214	03	Principal Author	9.1		
5.	A Review on Bioactive Metabolites and Health Benefits of Briphatpilu (Salvadora persica L.): A Medicinally Important plant.	International Journal of all research education and scientific methods (IJARESM), Vol-10, Issue-4, April-2022, Page no-2833-2838	ISSN: 2455-6211	7.429	01	Principal Author	9.1		
Total (1)							45.5		
(Note: Enclose all relevant documents in sequence).									

2. (a) Publication (other than Research Paper) (Books, Chapters in Books)

(i) Books Published with ISSN/ISBN number

S. No.	Title of Book with No. of Papers	Publishers name with ISSN/ISBN Number	Whether National/ International Publisher	No. of Co-Author	Whether Principal Author/Co-Author	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
Total (2-a (i))								
(Note: Enclose all relevant documents in sequence)								

2. (a) (ii) Chapters in Edited Books with ISSN/ISBN

S. No.	Title of Chapters with Page Nos.	Name of Books	Publishers name with ISSN/ISBN Number	No. of Co-Author	Whether Principal Author/Co-Author	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
1.	Forest Resources, Biotic Interference and Suggestion for conservation of Yawal - Pal wildlife sanctuary and its Environs, from Southern Satpuda Ranges(M.S.)	Advanced in plant Science. Volume-V	Bhumu Publishing, ISBN:- 978-93-91768-67-6	-	Principal Author	05		
Total (2-a (ii))						05		
(Note: Enclose all relevant documents in sequence)								

2. (a) (iii) Editor of Book with ISSN/ISBN

S. No.	Title of Book with Page Nos.	Publishers name with ISSN/ISBN Number	Whether National/ International Publisher	No. of Co-Author	Whether Principal Author/Co-Author	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
	NIL							
Total (2-a (iii))								
(Note: Enclose all relevant documents in sequence)								

2. (b) (i) Translation works in Indian and Foreign Languages by qualified faculties

S. No.	Title of chapters or research paper with page No.	Publishers name with ISSN/ISBN Number	Types of Translation Indian/Foreign Languages	No. of Co-Author	Whether Principal Author/Co-Author	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
Total 2 (b- (i))								
(Note : Enclose all relevant documents in sequence)								

2. (b) (ii) Translation works in Indian and Foreign Languages by qualified faculties

S. No.	Title of Book with page No.	Publishers name with ISSN/ISBN Number	Types of Translation Indian/Foreign Languages	No. of Co-Author	Whether Principal Author/Co-Author	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
Total 2 (b- (ii))								
Total 2. a (i + ii + iii) + 2. b (i + ii)						17		
(Note : Enclose all relevant documents in sequence)								

3. Creation of ICT mediated Teaching Learning pedagogy and content and development of new and innovative courses and curricula:

(a) Development of Innovative pedagogy

S. No.	Title of Development of Innovative pedagogy	Sponsored Agency if any	Type of Teaching-Learning Environments: Face to Face/Networked/Open & distance/virtual if any	Specify ICTs resources web link: You tube, Videos, Adios/Smart Classroom/Simulation Game/Blogging/Online Discussion forums/Virtual Laboratories/telecast/Picture/ Model/Charts if any	Date of Approval from authority	Date of Implementation	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
Total 3. (a)									
(Note: Enclose all relevant documents in sequence)									

3. (b) Design of new curricula and courses (02 points per curricula/course)

S. No.	Name of Programme where curricula introduced	Title of new curricula and course	Specify ICTs resources web link: You tube, Videos/ Adios/ telecast/Picture/Model/Charts if any	Date of Approval from authority	Date of Implementation	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
Total 3. (b)								

(Note: Enclose all relevant documents in sequence)

3. (c) MOOCs

i. Development of complete MOOCs in 4 quadrants (4 credits /Course)

S. No.	Name of Programme where curricula introduced	Title of new MOOCs curricula	Course Credits	Specify ICTs resources web link: You tube, Videos/ Adios/ telecast/Picture/Model/Charts if any	Date of Approval from authority	Date of Implementation	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
Total 3. (c) i									

(Note: Enclose all relevant documents in sequence)

3. (c) ii. MOOCs (Development in 4 quadrants) per module per lecturer

S. No.	Name of Programme where curricula introduced	Title of new MOOCs curricula	Course Credits	Specify ICTs resources web link: You tube, Videos/ Adios/ telecast/Picture/Model/Charts if any	Date of Approval from authority	Date of Implementation	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
Total 3. (c) ii									

(Note: Enclose all relevant documents in sequence)

3. (c) iii. Content Writer/subject matter expert for each module of MOOCs (at least 1 quadrant)

S. No.	Name of Programme where curricula introduced	Title of new MOOCs curricula	Course Credits	Specify ICTs resources web link: You tube, Videos/ Adios/ telecast/Picture/Model/Charts if any	Date of Approval from authority	Date of Implementation	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
Total 3. (c) iii									

(Note: Enclose all relevant documents in sequence)

3. (c) iv. Course Coordinator for MOOCs (4 Credit Course)

S. No.	Name of Programme where curricula introduced	Title of new MOOCs curricula	Course Credits	Specify ICTs resources web link: You tube, Videos/ Adios/ telecast/Picture/Model/Charts if any	Date of Approval from authority	Date of Implementation	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
Total 3. (c) iv									
Total 3. (c) i + ii + iii + iv									

(Note: Enclose all relevant documents in sequence)

3. (d) E-Content

3. (d) (i) Development of e-content in 4 quadrants for a complete course/e-book

S. No.	Title of E-content course/e-book with No. of pages, ISSN/ISBN No. if any	Name of Programme & Course to which introduced	Specify ICTs resources web link:	Whether peer reviewed	No. of Co-Author	Whether Principal Author/Co-Author	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
Subtotal 3. d. (i)									
(Note: Enclose all relevant documents in sequence)									

3. (d) (ii) e-content (developed in 4 quadrants) per module

S. No.	Title of E-content course/e-book with No. of pages, ISSN/ISBN No. if any	Name of Programme & Course to which introduced	Specify ICTs resources web link:	Whether peer reviewed	No. of Co-Author	Whether Principal Author/Co-Author	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
Subtotal 3. d. (ii)									
(Note: Enclose all relevant documents in sequence)									

3. (d) (iii) Contribution to development of e-content module in 4 complete course/paper/e-book (at least one quadrant)

S. No.	Title of E-content course/e-book with No. of pages, ISSN/ISBN No. if any	Name of Programme & Course to which introduced	Specify ICTs resources web link:	Whether peer reviewed	No. of Co-Author	Whether Principal Author/Co-Author	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
Subtotal 3. d. (iii)									
(Note: Enclose all relevant documents in sequence)									

3. (d) (iv) Editor of e-content for complete course/e-book

S. No.	Title of E-content course/e-book with No. of pages, ISSN/ISBN No. if any	Name of Programme & Course to which introduced	Specify ICTs resources web link:	Whether peer reviewed	No. of Co-Author	Whether Principal Author/Co-Author	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
Subtotal 3. d. (iv)									
Total 3. d. i + ii + iii + iv									
Total 3. a + b + c + d									
(Note: Enclose all relevant documents in sequence)									

4. Research Score:

4. (a) Research Guidance

S. No.	Degree	Number of candidate Enrolled	Number of Thesis Submitted with date	Number of candidate Degree awarded with date	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
1	*M. Phil/ *P.G dissertation		N/A				
2	Ph. D.						
Total 4. (a)							
*Note: Only awarded will be considered. (Note: Enclose all relevant documents in sequence)							

4. (b) & (c) Ongoing and Completed Research Projects

S. No.	Title of Research Project A/B	Sponsored Agency	Date of Sanction	Grant/Amount Mobilized (Rs. Lakhs)	Whether you are the PI/Co-PI/Consultant	Status Ongoing/Completed	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
Total 4. (b) & (c)									
Note 1: Principal Investigator and Co-investigator would be 50% each. (Note 2: Enclose all relevant documents in sequence)									

4. (d) Consultancy Projects:

S. No.	Title of Consultancy Project	Sponsored Agency	Date of Starting	Amount Mobilized (Rs. Lakhs)	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
Total 4. (b) & (c)							
Total 4. a + b + c + d							
Note 1: Principal Investigator and Co-investigator would be 50% each. (Note 2: Enclose all relevant documents in sequence)							

5. (a) Patents

S. No.	Title of patent project	Patent number	Sponsored agency if any	Date of award	National / International	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
Total 5. (a)								
(Note: Enclose all relevant documents in sequence)								

5. (b) *Policy Documents

S. No.	Title of Policy Documents	Name of submitted agency	International National State	Policy documents number	Date of Acceptation	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
Total 5. (b)								
(Note: Enclose all relevant documents in sequence)								

5. (c) Awards/ Fellowships

S. No.	Title of the Fellowships/Awards	Date of award received	Whether level International/ National	Name of Awardees Academic body/ Association	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
1.	Best Researcher Award	10&11 Sep.2021	International	VD GOOD Technology Factory Coimbtore India	05		
					05		
Total 5. (c)					05		
Total 5. (a) + (b) + (c)					05		
(Note: Enclose all relevant documents in sequence)							

6. *Invited Lectures/ Resource Person/Paper presentation in Seminars/ Conferences/full paper in Conference Proceedings (Paper presented in Seminars/Conferences and also published as full paper in Conference Proceedings will be counted only once).

S. No.	Title of presentation in Academic Session with date	Title of conference / Seminar	Mode of Lectures/Resource Person/ Paper presentation/ full paper in Conference Proceedings	Name of Organizer	Whether International (Abroad)/ International (within country)/ National /State/ University level	Self Appraisal Score	API Score Verified	Page no. of relevant Documents
1.	Beneficial effect of Medicinal plants in aquaculture.	International Conference on Aquaculture for rural development	Paper Presentation	Department of Zoology Dada patil Rajale ASC College Adinathnagar, tal-Pathardi, Dist-Ahmadnagar. Late. Ramesh Warpudkar College Sonpeth, Dist-Parbhani & Kalikadevi College Shirur, Dist-Beed. Milliya college, Beed.(M.S.)	International (within country)	05		
2	Ethnobotanical Report on some wild edible fruits of Beed District of Maharashtra	International E-Conference On life sciences Technology and Management in Association with international journal of scientific Research in science and Technology	Paper Presentation	Kalikadevi Arts, Commerce and Science Shirur (ka.) Beed (M.S.)	International (within country)	05		
3	Comparative, Quantitative HPTLC Analysis of Solasodine from in Vivo and in Vitro Leaf Sample of Solanum Virginianum L.	International E-Conference On life sciences Technology and Management in Association with international journal of scientific Research in science and Technology	Paper Presentation	Kalikadevi Arts, Commerce and Science Shirur (ka.) Beed (M.S.)	International (within country)	05		
4	Soybean Response to Biological and Chemical Fertilizers	International E-Conference On life sciences Technology	Paper Presentation	Kalikadevi Arts, Commerce and Science Shirur (ka.)	International (within country)	05		

		and Management in Association with international journal of scientific Research in science and Technology		Beed (M.S.)				
Total .						20		
(Note: Enclose all relevant documents in sequence)								

SUMMARY OF RESEARCH SCORE

S. No	Details of Academic/ Research Activities	Total Self appraisal Score claimed by the candidate	API Score verified by Committee	Remarks
1.	Research Papers in Peer-Reviewed or UGC listed Journals	45.5		
2.	Publications other than journal or research paper (a). Books authored (b). Translation works	05		
3.	Creation of ICT mediated Teaching Learning pedagogy and content and development of new and innovative courses and curricula a. Development of Innovative pedagogy. (b) Design of new curricula and courses. (c) MOOCs. (d) E-Content	---		
4.	(a) Research Guidance (b) Research Projects Completed (c) Research Projects Ongoing (d) Consultancy	---		
5.	(a) Patents (b) Policy Documents (c) Awards/Fellowships	05		
6.	*Invited lectures / Resource Person/ paper presentation in Seminars/ Conferences/full paper in Conference Proceedings (Paper presented in Seminars/Conferences and also published as full paper in Conference Proceedings will be counted only once)	20		
Total		75.5		

SUMMARY OF API SCORE

Table	Category	Criteria	Overall grading	Annual API Score	Remarks
1	I	Teaching related activities, Domain knowledge	Good		
	II	Involvement in the University/ College students related activities / research activities	Good		
2	III	Academic/ Research Score	Good	75.5	

I certify that the information provided is correct as per records with the University and/or documents enclosed along with the duly filled PBAS proforma.

Place : Majalgaon
Date : 25/7/2022

B. Salunkhe

Signature of the Faculty with Designation

Place : Majalgaon
Date : 25/7/2022

self

Signature Head of the department

Place : Majalgaon
Date : 27/7/2022

[Signature]

Signature IOAC Coordinator
Coordinator
Internal Quality Assurance Cell (IQAC)
Sundarrao Solanke Mahavidyalaya,
Majalgaon, Dist. Beed (MS)

Place : Majalgaon
Date : 20/7/2022

[Signature]
Principal
PRINCIPAL
Sundarrao Solanke Mahavidyalaya
Majalgaon Dist. Beed (M.S.)



VDGOOD[®]
Technology Factory

International Scientist Awards on
Engineering, Science and Medicine
10 & 11-Sep-2021 | Coimbatore, India.

CERTIFICATE OF ACHIEVEMENT

This is to certify that

Dr. INDRARAO BHAURAO SALUNKHE

ASSOCIATE PROFESSOR,
DEPARTMENT OF BOTANY,
SUNDERRAO SOLANKE MAHAVIDYALAYA,
MAHARASHTRA, INDIA.

Has been Awarded

BEST RESEARCHER AWARD

In the International Scientist Awards on Engineering, Science and Medicine, held on 10 & 11-Sep-2021,

Coimbatore, India, Organized by VDGGOOD Professional Association.

Dr. Shreeniwas K. Omanwar

Selection Committee



M.S.P. Mandal's

SUNDERRAO SOLANKE MAHAVIDYALAYA, MAJALGAON DIST. BEED

TIME TABLE

Name of the Teacher : Dr. Indrarao Bhaurao Salunkhe

Year : 2021-2022

Department : Botany

Subject : Botany

Class : F.Y, S.Y, T.Y B.sc

Day / Time	7:30 to 10:00			10:00 to 10:50	10:50 to 11:40	11:40 to 12:30	12:30 to 1:20	1:20 to 2:10	2:10 to 3:00				
Monday						SY Bsc Th.							
Tuesday	Fy Bsc Practical					SY Bsc Th.							
Wednesday	Ty Bsc Practical					SY Bsc Th.							
Thursday	Ty Bsc Practical						TY Bsc Th.						
Friday	SY Bsc Practical						TY Bsc Th.						
Saturday	SY Bsc Practical						TY Bsc Th.						

B. Salunkhe
Signature of Teacher

Practical - $5 \times 3 = 15$
B.Sc II Yr Th. - $1 \times 3 = 03$
B.Sc III Yr. Th. - $1 \times 3 = 03$
Total Workload = 21

B. Salunkhe
Signature of Head of Department

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NAAC Re-Accredited 'A' grade
ISO - 9001 : 2015 Certified
Excellent Study Centre Award
Yashwantrao Chavan Maharashtra
Open University Nashik (Maharashtra)

Dr. G.K. Sanap
M.Sc., Ph.D.
I/C PRINCIPAL



Marathwada Shikshan Prasarak Mandal's

Sunderrao Solanke Mahavidyalaya

Majalgaon (431 131) Dist. Beed (M.S.)

Affiliated to : Dr. Babasaheb Ambedkar Marathwada University, Aurangabad,
Study Center : Yashwantrao Chavan Maharashtra Open University Nashik (Maharashtra)

Principal - 02443 - 234037
Office - 02443 - 236491
Fax - 02443 - 236491

Email : majalgaon_college123@yahoo.in
Website : www.ssmmajalgaons.com

Ref.No.SSMM/

Date : 17/6/2021

To,

Dr. I. B. Salunkhe,

Head Department of Botany,

Sunderrao Solanke Mahavidyalaya Majalgaon

Sub – Regarding Responsibility on various committee for year 2021-22

Sir,

With above cited subject, I wish to state here that you are appointed on various committees as follows

- 1) Chairman of Garden Committee.
- 2) Chairman of Green Audit Committee.
- 3) Chairman of Green Club.
- 4) Member of Competitive Examination Study center committee
(Sunderratna Career Academy)


Principal

Principal
Sunderrao Solanke Mahavidyalaya
Majalgaon Dist. Beed (M.S.)



कल्याणें होत आहे रे । आधीं केलेंची पाहिजे ।।
भारतीय शिक्षण प्रसारक संस्था, अंबाजोगाई संचलित

श्री सिध्देश्वर महाविद्यालय, माजलगाव

ता.माजलगाव जि.बीड ४३१ १३१ (महाराष्ट्र)
(कला, विज्ञान व वाणिज्य)

नेक मुल्यांकन दर्जा 'बी'

कार्यालय: (०२४४३) २३५ ४७५, २३५ ९०१ फॅक्स: २३५ ४७५

Website: www.siddheshwarcollege.com

डॉ.महेश प्र. देशमुख
(एम.ए. पीएच.डी.)

E-mail: siddheshwar.college@gmail.com

श्रीसिममा/२०२१-२२/

दि. 16/09/2021

आभार पत्र

प्रति,

Dr. J. B. Salunkhe

sundarrao salunke mahavidhyalya

Majalgaon D. Beed.

दि.16/09/2021 (गुरुवार) रोजी सकाळी 11:00 वा. घडयाळी तासिका तत्वावरील मुलाखती
करिता आपण उपस्थित राहून सहकार्य केले त्या बद्दल आपले मनःपूर्वक आभार.

धन्यवाद...!

आपला

भारतीय

श्री सिध्देश्वर महाविद्यालय
माजलगाव जि.बीड ४३११३१



केल्यानें होत आहे रे । आधीं केलेंची पाहिजे ।।
भारतीय शिक्षण प्रसारक संस्था, अंबाजोगाई संचलित

श्री सिध्देश्वर महाविद्यालय, माजलगाव

ता.माजलगाव जि.बीड ४३१ १३१ (महाराष्ट्र)
(कला, विज्ञान व वाणिज्य)

नॅक मुल्यांकन दर्जा ' बी '

कार्यालय: (०२४४३) २३५ ४७५, २३५ ९०१ फॅक्स: २३५ ४७५

Website: www.siddheshwarcollege.com

डॉ.महेश प्र. देशमुख
(एम.ए. पीएच.डी.)

E-mail: siddheshwar.college@gmail.com

श्रीसिममा/२०२१-२२/

दि. 15/09/2021

प्रति,

डा. साळुंरवे आय.बी.
सुंदरवाव सोळाळे महाविद्यालय,
माजलगाव.

विषय: विषय तज्ञ म्हणुन उपस्थित रहाणे बाबत...

महोदय,

उपरोक्त विषयी आपणांस कळविण्यात येते की, सदर महाविद्यालयात दि.16/09/2021 (गुरुवार) रोजी सकाळी 11:00 वा. घडयाळी तासिका तत्वावरील नियुक्ती संदर्भात मुलाखती आयोजित करण्यात आलेल्या आहेत. वेळरूपतीशास्त्र या विषयाचे विषय तज्ञ म्हणुन आपली नियुक्ती करण्यात आलेली असुन या करिता आपण उपस्थित राहुन प्रक्रिया पार पाडणे बाबतची कार्यवाही करावी.


धन्यवाद...!

आपला

प्र. भायें

श्री सिध्देश्वर महाविद्यालय
माजलगाव जि.बीड 431131

खालील प्राध्यापकांची नियुक्ती डॉ. बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ परीक्षा जून 2022 साठी अंतर्गत भरारी पथक व आवश्यकता पडल्यास इन्वीझलेशन करण्यासाठी करण्यात आलेली आहे. तरी सर्वांनी परीक्षेचे काम करणे अनिवार्य आहे.


Principals
Sardarrao Bobalrao Mahavithyaleya
M. S. D. S. Dist. H. S. (M. S.)

दिनांक 01/06/2022 ते 10/06/2022

सकाळ सत्र : 08:30 ते 01:05

दुपार सत्र: 01:30 ते 6:00

- 1) डॉ. गंगणे के.बी.
- 2) डॉ. देशमुख एस. बी.
- 3) डॉ. साळुंखे आय.बी.
- 4) डॉ. रुद्रवार एस.एस
- 5) डॉ. कचरे ए.ए.

2) डॉ. नळे बी.आर.

- 1) डॉ. पवार आर.टी.
- 3) डॉ. मोकासरे जी.टी.
- 4) डॉ. ढवळे एन.आर.
- 5) डॉ. डाके एस. ए.

दिनांक 11/06/2022 ते 21/06/2022

सकाळ सत्र : 08:30 ते 01:05.

दुपार सत्र : 01:30 ते 6:00

- 1) डॉ. व्यवहारे एस.के.
- 2) डॉ. देशपांडे पी.ए.
- 3) डॉ. इप्पर एस.एन.
- 4) डॉ. शिंदे डी.एस.

- 1) डॉ. पेंटावार ए.एस.
- 2) डॉ. वानखडे एम. एस.
- 3) डॉ. काळे बी.एस.
- 4) डॉ. गवळी सुहास.



केल्यानें होत आहे रे । आधीं केलेंची पाहिजे ।।
भारतीय शिक्षण प्रसारक संस्था, अंबाजोगाई संचलित

श्री सिध्देश्वर महाविद्यालय, माजलगाव

ता.माजलगाव जि.बीड ४३१ १३१ (महाराष्ट्र)
(कला, विज्ञान व वाणिज्य)

नेक मुल्यांकन दर्जा 'बी'

डॉ.महेश प्र. देशमुख
(एम.ए. पीएच.डी.)

कार्यालय: (०२४४३) २३५४७५, २३५९०१ फॅक्स: २३५४७५

Website: www.siddheshwarcollege.com

E-mail: siddheshwar.college@gmail.com

01/09/2021

To,

The Principal

Sundarrao Solanke

Mahavidhyalaya,

Majalgaon D. Beed.

Sub:- Appointment of External Examiner

Shri. Dr. I. B. Salunkhe Lecturer in Botany

Has been appointed as an External Examiner to Conduct the Practical Examination
in Subject Botany Of class B.Sc.I,II,III Year

Dated 02/03/09/21 In our College. This is for Your kind Information.


Thanking You!

Yours Faithfully,

Copy to: 1] Dr. I. B. Salunkhe.

2] The Controller of Examination

Dr.B.A.M.U. Aurangabad.


Principal
Shri. Siddheshwar Mahavidyalaya
Majalgaon-431131 Dist. Beed

नेक-पुर्णमुल्यांकन 'अ' दर्जा
आय:एस.ओ. - १००१ : २०१५ प्रमाणित
उत्कृष्ट अभ्यास केंद्र पारीतोषिक :
यशवंतराव चव्हाण महाराष्ट्र मुक्त विद्यापीठ, नाशिक



मराठवाडा शिक्षण प्रसारक मंडळाचे

सुंदरराव सोलंके महाविद्यालय

माजलगाव (४३९ ९३९) जि.बीड

सलगीत - डॉ.बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद

अभ्यासकेंद्र - यशवंतराव चव्हाण महाराष्ट्र मुक्त विद्यापीठ, नाशिक

डॉ.जी.के.सान्य

एम.एस्सी., पीएच.डी.

प्र-प्राचार्य

Principal - 02443 - 234037

Office - 02443 - 236491

Fax - 02443 - 236491

Email : majalgaon_college123@yahoo.in

Website : www.ssmmajalgaons.com

जा.क्र.एस.एस.एम.एम./2021-2022 / 196

दिनांक : 02/09/2021

To,
The Controller of Examination,
Dr.Babasaheb Ambedkar Marathwada University,
Aurangabad.

Subject: - Appointment as **External** Examiner for B. Sc. IInd and IIIrd year
Practical Examination in the subject of **Botany**.

Reference: - University letter Ref. No. Exam/Practical Exam./B.Sc./2020-21
Date: 11/08/2021.

Sir,

With reference to the above cited subject, **Dr. I. B. Salunkhe**, Dept. of Botany, **Sunderrao Solanke Mahavidyalaya, Majalgaon Dist. Beed** is appointed as an **External** Examiner to conduct the B.Sc. IInd and IIIrd year - University Practical Examination April/May-2021 (held in July/August, 2021) in the subject of **Botany** at **Sunderrao Solanke Mahavidyalaya, Majalgaon Dist. Beed** from **04/09/2021 to 05/09/2021 and 08/09/2021 to 09/09/2021**.

This is for your information and necessary action.

Thanking you.

Yours faithfully,

Principal

Principal

Sunderrao Solanke Mahavidyalaya

Majalgaon Dist. Beed. (M.S)

Copy to:-

- 1) **Dr. I. B. Salunkhe**, Sunderrao Solanke Mahavidyalaya, Majalgaon Dist. Beed.
- 2) Head Dept. of **Botany**, Sunderrao Solanke Mahavidyalaya, Majalgaon Dist. Beed

नेक-पूर्ण मुल्यांकन 'अ' दर्जा
आय.एस.ओ. - १००१ : २०१५ प्रमाणित
उत्कृष्ट अभ्यास केंद्र पारितोषिक :
यशवंतराव चव्हाण महाराष्ट्र मुक्त विद्यापीठ, नाशिक

डॉ. जी. के. सानव
एम.एस्सी., पीएच.डी.
प्र-प्राचार्य



मराठवाडा शिक्षण प्रसारक मंडळाचे

सुंदरराव सोलंके महाविद्यालय

माजलगाव (४३१ १३१) जि.बीड

सलमनीत - डॉ.बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद

अभ्यासकेंद्र - यशवंतराव चव्हाण महाराष्ट्र मुक्त विद्यापीठ, नाशिक

Principal - 02443 - 234037
Office - 02443 - 236491
Fax - 02443 - 236491

Email : majalgaon_college123@yahoo.in
Website : www.ssmmajalgaons.com

जा.क्र.एस.एस.एम.एम./2021-22/442

दिनांक : 03 / 02 / 2022

To,
The Controller of Examination,
Dr.Babasaheb Ambedkar Marathwada University,
Aurangabad.


Subject :- Appointment as **External** Examiner for B.Sc. I, II and III year
Practical Examination in the subject of **Botany**.

Reference :- University letter Ref.No. Exam/Practical Exam./B.Sc./2021-22/1608
Date : 19/20-01-2022.

Sir,
With reference to the above cited subject, **Dr.I.B.Salunkhe , Sunderrao Solanke Mahavidyalaya, Majalgaon Dist.Beed** is appointed as an **External Examiner** to conduct the B.Sc.I, II and III year University Practical Examination **Oct./Nov.-2021 (held in Feb./Mar.2022)** in the subject of **Botany** at **Sunderrao Solanke Mahavidyalaya, Majalgaon Dist.Beed** from **01/02/2022 to 03/02/2022**.

This is for your information and necessary action.
Thanking you.

Yours faithfully,


Principal
Sunderrao Solanke Mahavidyalaya
Majalgaon Dist.Beed.(M.S.)

Copy to :-

- 1) **Dr.I.B.Salunkhe , Sunderrao Solanke Mahavidyalaya, Majalgaon Dist.Beed.**
- 2) Head Dept.of **Botany** Sunderrao Solanke Mahavidyalaya, Majalgaon Dist.Beed



B. S. P. Sanstha's Ambajogai

SHRI SIDDHESHWAR MAHAVIDYALAYA, MAJALGAON

(Art's, Science & Commerce)

Dist - Beed 431 131 (Maharashtra)

NAAC ACCREDITED - 'B'

I/C Principal

Dr. Mahesh P. Deshmukh

(M.A. Ph.D.)

Office : (02443) 235475 , 235901, Fax.No. : 235475

Website : www.siddheshwarcollege.com E-mail : siddheshwar.college@gmail.com

ज.सं./Exam/ 2017/ 441

Date : दि. 14/05/22

To,

Dr. I. B. Salunkhe
sunderrao solankhe
mahavidhyalya, majalgaon

Sub: - Appointment of External Examiner

Shri Dr. I. B. Salunkhe Lecturer in Botany has been appointed as an External Examiner to conduct the Practical Examination in Subject Botany of Class B.A., B.Sc. & B.Com. I, II, III Year Dated on 17, 18, 19 & 20/05/22 in our College.

This is for your kind Information.


Thanking You !

Yours Faithfully,

Copy to: 1] _____

2] The Controller of Examination

Dr. B. A. M. U. Aurangabad.


Principal
Shri Siddheshwar Mahavidyalaya
Majalgaon, Dist. Beed

नेक-पुर्ण:मुल्यांकन 'अ' दर्जा
आय.एस.ओ.-१००१ : २०१५ प्रमाणित
उत्कृष्ट अभ्यास केंद्र पारीतोपिक :
यशवंतराव चव्हाण महाराष्ट्र मुक्त विद्यापीठ, नाशिक

डॉ. जी. के. सान्ख
एम.एस्सी., पीएच.डी.
प्र-प्राचार्य



मराठवाडा शिक्षण प्रसारक मंडळाचे

सुंदरराव सोळंके महाविद्यालय

माजलगाव (४३९ ९३९) जि.बीड

सलमनीत - डॉ.बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद
अभ्यासकेंद्र - यशवंतराव चव्हाण महाराष्ट्र मुक्त विद्यापीठ, नाशिक

Principal - 02443 - 234037
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Email : majalgaon_college123@yahoo.in
Website : www.ssmmajalgaons.com

जा.क्र.एस.एस.एम.एम./ 2022-23/22

दिनांक : 18/05/2022

To,
The Controller of Examination,
Dr.Babasaheb Ambedkar Marathwada University,
Aurangabad.

Subject :- Appointment as **Internal Examiner** for B.Sc. Second and Third year
Practical Examination in the subject of **Botany**.

Reference :- University letter Ref.No. Exam/Practical Exam./B.Sc./2021-22/64-66
Date : 06-05-2022.

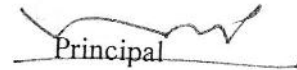
Sir,

With reference to the above cited subject, **Dr.I.B.Salunkhe, Sunderrao Solanke Mahavidyalaya, Majalgaon Dist.Beed** is appointed as an **Internal Examiner** to conduct the B.Sc.Second and Third year University Practical Examination **Mar./April-2022 / (held in June/July-2022)** in the subject of **Botany** at Sunderrao Solanke Mahavidyalaya, Majalgaon from **23/05/2022, 24/05/2022, 25/05/2022 and 26/05/2022.**

This is for your information and necessary action.

Thanking you.

Yours faithfully,


Principal

Copy to :-

- 1) **Dr.I.B.Salunkhe**, Sunderrao Solanke Mahavidyalaya, Majalgaon Dist.Beed
- 2) Head Dept.of **Botany** Sunderrao Solanke Mahavidyalaya, Majalgaon Dist.Beed

Principal
Sunderrao Solanke Mahavidyalaya
Majalgaon Dist.Beed (M.S.)

NAAC Re-Accredited 'A' grade
ISO 9001:2015 Certified
Excellent Study Centre Award:
Yashwantrao Chavan Maharashtra
Open University Nashik(Maharashtra)

Dr. G.K.Sanap
M.Sc.,Ph.D.
I/C PRINCIPAL



Marathwada Shikshan Prasarak Mandal's

Sunderrao Solanke Mahavidyalaya

Majalgaon (431 131) Dist. Beed (M.S.)

Affiliated to : Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
Study Center : Yashwantrao Chavan Maharashtra Open University Nashik(Maharashtra)

Principal - 02443 - 234037
Office - 02443 - 236491
Fax - 02443 - 236491

Email : majalgaon_college123@yahoo.in
Website : www.smmajalgaons.com

Ref.No.SSMM/ 2021-2022/516

Date : 10 03 2022

प्रती,

डॉ. इंद्रजीत साळुंखे

वनस्पतीशास्त्र विभाग, सुंदरराव सोळंके महाविद्यालय,
माजलगाव. -

विषय: एन.एन.एस. च्या विशेष वार्षिक शिबिरात व्याख्यानासाठी निमंत्रण स्वीकारणे
बाबत.

महोदय,

वरील विषयी आपणास कळविण्यात येते की, सुंदरराव सोळंके महाविद्यालयाच्या
एन.एन.एस.विभागाच्या वतीने मौजे चिंचगवाण येथे दि. ११/०३/२०२२ ते
१७/०३/२०२२ या कालावधीत विशेष वार्षिक शिबिराचे आयोजन करण्यात आले आहे.

विशेष वार्षिक शिबिरात दि.११/०३/२०२२ रोजी पर्यवेक्षण संश्लेषण

या विषयावर मार्गदर्शन करण्यासाठी उपस्थित राहावे हि विनंती. आमच्या विनंतीस मान
देऊन आपण कार्यक्रमास उपस्थित राहाल याची आम्हास पूर्ण खात्री आहे.

धन्यवाद.

Principal
Sunderrao Solanke Mahavidyalaya
Majalgaon Dist. Beed (M.S.)

NAAC Re-Accredited 'A' grade
ISO - 9001 : 2015 Certified
Excellent Study Centre Award:
Yashwantrao Chavan Maharashtra
Open University Nashik(Maharashtra)

Dr. G.K.Sanap
M.Sc., Ph.D.
I/C PRINCIPAL



Marathwada Shikshan Prasarak Mandal's

Sunderrao Solanke Mahavidyalaya

Majalgaon (431 131) Dist. Beed (M.S.)

Affiliated to : Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
Study Center : Yashwantrao Chavan Maharashtra Open University Nashik(Maharashtra)

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Email : majalgaon_college123@yahoo.in
Website : www.ssmmajalgaons.com

Ref.No.SSMM/ 2021-24/530

Date : / /

प्रती,

डॉ. इंद्रजीत साळुंखे

वनस्पतीशास्त्र विभाग, सुंदरराव सोळंके महाविद्यालय ,

माजलगाव. -

विषय: आभारपत्र

महोदय,

वरील विषयानुसार, राष्ट्रीय सेवा योजना, सुंदरराव सोळंके महाविद्यालयाच्या वतीने दि. ११/०३/२०२२ ते १७/०३/२०२२ या कालावधीत सात दिवसीय विशेष राष्ट्रीय शिबीर आयोजित करण्यात आले.

या शिबिरात दि. ११/०३/२०२२ रोजी पत्रविशेष संरक्षण या विषयावर आपण स्वयंसेवकांना मार्गदर्शन केले. आपले मार्गदर्शन राष्ट्रीय सेवा योजनेतील स्वयंसेवकांना राष्ट्रनिर्माणाच्या कार्यात त्यांचे महत्व अधोरेखित करणारे व त्या कार्याप्रती त्यांना प्रेरणा देणारे ठरेल. आमच्या विनंतीस मान देऊन व आपला बहुमूल्य वेळ देऊन या व्याख्यानासाठी उपस्थित राहिलात त्याबद्दल आपले मनःपूर्वक आभार.

धन्यवाद.

Principal

Sunderrao Solanke Mahavidyalaya
Majalgaon Dist. Beed (M.S.)



ICARD

May, 07, 2022

75
Azadi Ka
Amrit Mahotsav



INTERNATIONAL CONFERENCE ON AQUACULTURE FOR RURAL DEVELOPMENT

under the program of MoU between the Department of Zoology of the Dadapatil Rajale Arts, Science and Commerce College, Adinathnagar, Tal. Pathardi, Dist. Ahmednagar, Affiliated to S.P.P. University, Pune., Late Ramesh Warpudkar Art, Commerce Science College, Sonpeth, Dist. Parbhani (M.S.), Affiliated to S.R.T.M. University, Nanded; Kalikadevi Arts, Commerce and Science College, Shirur (Ka.), Dist. Beed and Milliya Arts, Science & Management Science College Beed (M.S.) Affiliated to Dr. B.A.M. University, Aurangabad

CERTIFICATE OF PARTICIPATION

This is to Certify that

Mr./Ms./ Dr.

**Dr Indrarao B. Salunkhe, Department of Botany, Sunderrao Solanke Mahavidyalaya
Majalgaon, District-Beed**

for actively participated in the one-day International Conference on 'Aquaculture for Rural Development (ICARD-2022)' Organized under the MoU between of Department of Zoology on May, 07, 2022. He/She has presented a research paper/poster entitled..

: *Beneficial effect of Medicinal plants in aquaculture*

Dr. Tanvir S. Pathan
Convener-ICARD-22,
Kalikadevi Arts, Commerce
& Science College, Shirur (Ka.),
Dist. Beed (M.S.).

Dr. Atul R. Chourpagar
Convener-ICARD-22,
Dadapatil Rajale Arts, Science & Commerce
College, Adinathnagar, Tal. Pathardi,
Dist. Ahmednagar (M.S.).

Dr. Santosh V. Rankhamb
Convener-ICARD-22,
Late Ramesh Warpudkar Art,
Commerce & Science College,
Sonpeth, Dist. Parbhani (M.S.).

Dr. Sairy Abdullah
Convener-ICARD-22,
Milliya Arts, Science &
Management Science
College, Beed (M.S.)

Beneficial Effect of Medicinal Plants in Aquaculture

Dr. Salunkhe I. B.

Department of Botany,

Sunderrao Solanke Mahavidyalaya, Majalgaon

Dist- Beed, India

Abstract

Diseases are recognized as one of the main constraints to sustainable animal production, which can cause significant economic loss mainly in aquaculture. Disease outbreaks increase proportionally with increases in intensive aquaculture. In order to prevent large economic losses due to fish illnesses, various medications are used for prevention and treatment. Different chemicals (antibiotics, hormones, chemotherapeutics and vitamins) have been used in fish farming for several years to prevent diseases or reduce their effects on aquaculture. However, these chemicals caused damage to the environment, fish and humanity is very high. Due to this in the recent years, natural environment friendly alternatives are being sought over the last few years to replace harmful chemical and antibiotics for this purpose. The plants are rich in secondary metabolites and phytochemical compounds, which have an effect against viral, bacterial, and parasitic diseases in fish. Plants have been reported to produce various effects such as antistress, growth promotion, appetite stimulation, immunostimulation, aphrodisiac and to have antipathogen properties in fishes and shrimp aquaculture as the plants are rich in the alkaloids, terpenoids, tannins, saponins and flavonoids. The number of medicinal plants is often used as additives in fish feeds to promote growth, and sometimes, in the form of baths or injections. The use of natural products from the medicinal plants are cheaper source of growth is making waves in the aquacultural industry as opposed to the expensive synthetic antibiotics and other growth promoters.

Keyword: -Medicinal plants, Aquaculture



Preliminary Survey on timber yielding plants of Yawal-Pal wildlife sanctuary and it's adjacent area in Southern Satpuda Ranges from Jalgaon District (M.S).

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Abstract : The present study is based on the preliminary survey on timber yielding plants resources of Yawal-Pal wildlife sanctuary and it's adjacent area from Southern Satpuda ranges during 1991 – 1995 and again repeated the survey in 2017-2019. The results showed that 70 timber yielding plants belonging to 33 families and 53 genera. Among the different families fabaceae family is dominant with 10 species followed by Mimosaceae and Caesalpiniaceae with 9 and 6 species respectively. Timber species are used by tribals and villagers for hut, house construction and Agriculture equipment's. Now a days the demand of the timber increases for the same. Paper factory needs Bamboo and other soft wood. Forest is also cut for electrification. So measures should be adopted to prevent the massive deforestation prevailing in the area.

Keywords - Plants resources, Deforestation, survey, Yawal-Pal wildlife sanctuary, District Jalgaon.

I. INTRODUCTION

Timber plays a vital role in the economic and industrial development. Timber products are eco-friendly than the other variants made from metals, plastics and cement as these are recyclable, energy efficient and reduce greenhouse gases. Timber is the one of the most versatile and valuable raw material used by the man (Singh, *et.al.*, 2021). The timber yielding plants species are used by tribals and villagers for hut, house construction, agricultural equipment's, boat building, toys, Musical instruments furniture and Grinding equipments. (Vijigiri, and Sharma, 2012; Singh, 2018; Dobhal, *et.al.*, 2010).

Satpuda mountain range is major topographical features of central India. There are seven ranges of Satpuda which run more or less parallel to each other. According to karnik (1959), Satpuda starts from Mahadev hills of Chauragarh in Madhya Pradesh, extending westward to Burhanpur and Nimar, thence to Khandesh. Mountain tracks of Satpuda are situated between Vindhya ranges and Chandor hills of Sahyadri's from the Western Ghats.

II. THE STUDY AREA

Southern Satpuda is divided into three talukas namely Chopda, Yawal and Raver. The Yawal wildlife sanctuary and Pal forest park is situated in these three talukas. This area lies between 700.41' and 7609.73' E longitudes and 210 3.42' and 210.25' N latitudes. This area is about 120 Kilometers in length having width of 45 kilometers. The average height of this area is 721 meters and it varies between 700 to 1150 meter.

The headquarter of sanctuary is at Yawal. It covers an area of 177.52 sq.kms. Height of the sanctuary varies between 700m to 1134m. Highest hillock is situated near the Gawilgad hills; in Yawal taluka (1134 m.). The rainfall of sanctuary varies between 800-900 mm. The average maximum and minimum temperature is 430 C. and 80 C. respectively.

III. CLIMATE

Climate of the study area is identified in three well defined seasons viz. Winter (Nov-Feb), Summer (March-May) and rainy season (June-Oct).

1. Rainfall : Average annual rainfall of area was Chopda 661.27mm. , Yawal 670.54mm. and Raver 634.63 mm. respectively. Maximum rainfall occurs during the month of August.

2. Temperature : Temperature rises rapidly after February. May is hottest month of the year. The maximum temperature rises upto 460 C. December is usually the coldest month. minimum temperature varies between 70 C. - 150C.
3. Humidity: Humidity is one of the important factor, which affects the growth of the plant species and quality of the vegetation. Relative humidity is maximum during July and August 80% to 95% and minimum during May and April (30% to 40%). Hence due to constant rainfall and humidity, we found quality timber species in Southern satpuda ranges.

IV. MATERIAL AND METHODOLOGY

The botanical excursions were arranged to cover all the places of botanical interest and to collect most of the plants in their flowering and fruiting stages. Timber species were brought to the laboratory and identified with the help of Floras such as Cooke (1958), Hooker (1872 to 1897) and Santapau (1967). Collected specimen where compared with authentic ones in the herbarium of the Botanical survey of India, Western circle, Pune and Agharkar Research Institute, Pune. After identification of plants, specimens were pressed, poisoned and labeled. Saturated solution of mercuric chloride in ethyl alcohol was used for poisoning the specimens. Then herberium sheets have been deposited in the herbarium Department of Botany, University of Poona, Pune 411007.

V. RESULT AND DISCUSSION

Timber has been a major natural resource in all civilizations across the world. The demand for timber has been traditionally met only from the forests. Large scale utilization of timber, especially after the industrialization, has reduced the natural timber stock acutely in several tropical and temperate countries. India is one of the largest timbers producing as well as importing country due to its increasing demand for both domestic and industrial utility.

In the present work Preliminary survey on timber yielding plants of Yawal-Pal wildlife Sanctuary and it's adjacent area has been carried out. Data were collected and it is observed that 70 Angiosperm timber yielding plants belong to 33 families and 53 genera. They are arranged alphabetically according to their scientific names, families and vernacular names. Previous work on the timber yielding plant was carried out by several workers like 54 timber yielding plant belonging to 54 species and 23 families were identified from Alirajpur district, Madhya Pradesh, India (Panchya, 2021) and the other researcher identified 27 timber yielding plants belonging to 25 genera and 13 families from Bhadravathi Taluka, Karnataka (Kumar and Kiran, 2016). The phytochemical work on individual plants is carried out by number of workers; qualitative investigation was carried out in *Acacia leucophloea* (Roxb.) Willd. (Wankhade, 2019).

VI. CONCLUSION

India is one of the largest timbers producing as well as importing country due to its increasing demand for both domestic and industrial utility. The exploration of timber yielding plants is need of the present era because of its utility. The present work provides the documentation and appropriate utilization of timber yielding plant in the study area. People of these are having the good knowledge about of the timber yielding plants, but the urbanization and industrialization may result in the loss of the several species from the area. The lesser known timbers trees with multipurpose utility need to be given more attention for improvement, popularization and marketing in the future so that pressure on few selected timber species can be reduced.

Fig. No. 1- Distribution of timber yielding taxa within family genera and species.

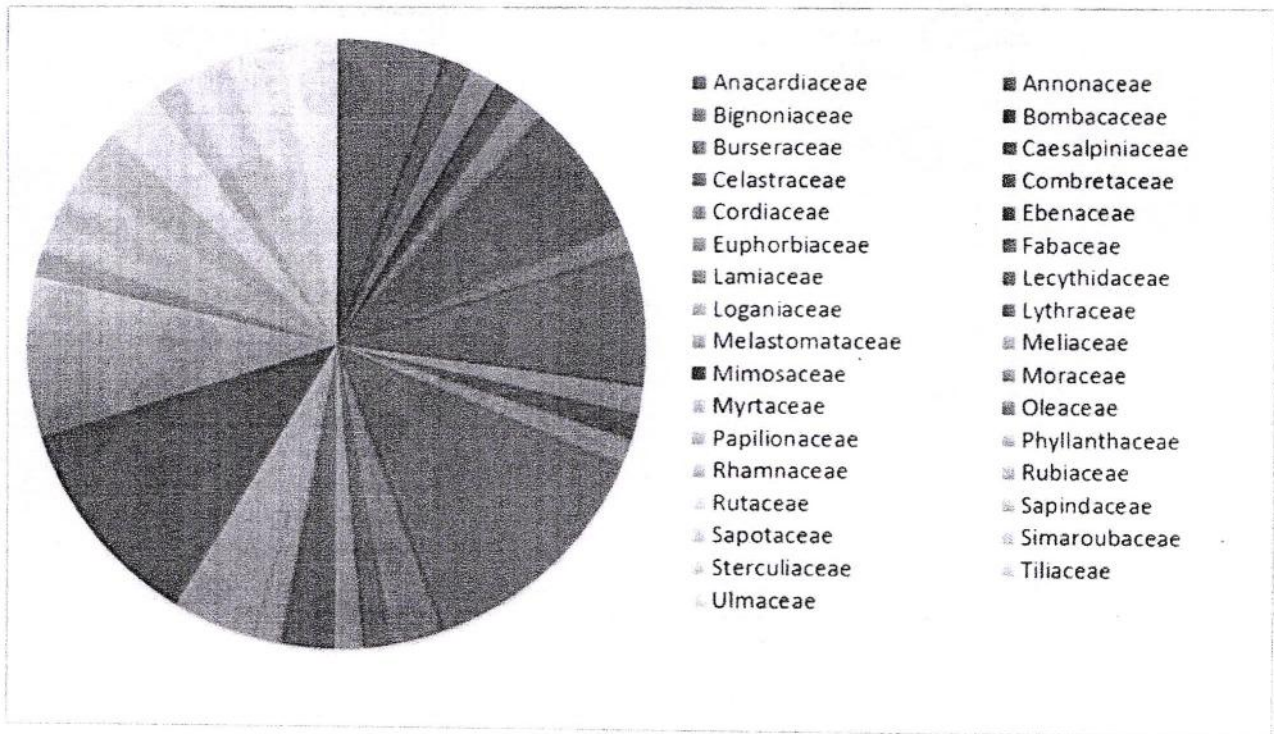


Fig. No.2- Distributin of timber yielding plants within family, genera and species

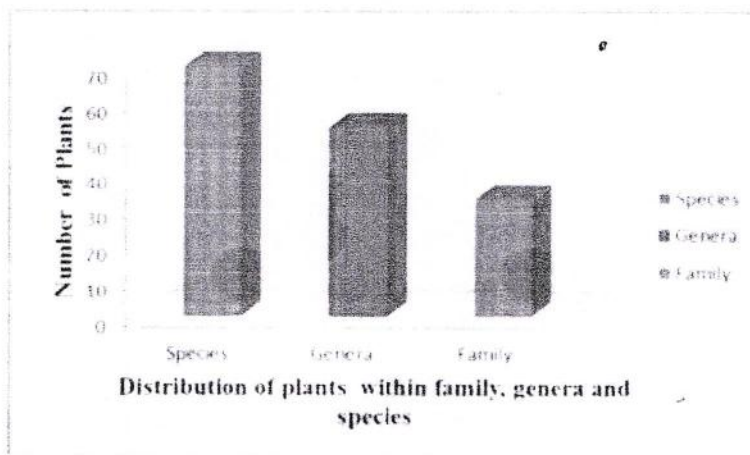


Table 1- Timber yielding plants from the study area.

Sr.No	Botanical Name	Local Neme	Family
1.	<i>Acacia leucophloea</i> (Roxb.) Willd	'Hiwar'	Mimosaceae
2.	<i>Acacia ferruginea</i> DC.	'Ghatsag', 'Pandhara khair'	Mimosaceae
3.	<i>Acacia polyacantha</i> Willd.	'Sonkhairi'	Mimosaceae
4.	<i>Acacia nilotica</i> (L.) Delile	'Babul'	Mimosaceae
5.	<i>Acacia chundra</i> (Roxb. Ex Rottl. Willd.)	'kher', 'khair'	Mimosaceae
6.	<i>Albizia procera</i> Benth	'Gurar', 'Safed-Siris'	Mimosaceae
7.	<i>Albizia lebbek</i> (L.) Benth	'Sirisha', 'Chinchola'	Mimosaceae
8.	<i>Albezia odoratissima</i> (L.F.) Benth.	'Chichwa', 'Kalashiras'	Mimosaceae
9.	<i>Anogeissus latifolia</i> (Roxb. Ex DC) Wall ex. Guill and per.	'Dhaura', 'Davda'	Combretaceae
10.	<i>Aegle marmelos</i> (L.) Corr.	'Bila', 'Bel'	Rutaceae
11.	<i>Azadirachta indica</i> A.Juss.	'Nimb', 'Neem'	Meliaceae
12.	<i>Ailanthus exculsa</i> Roxb.	'Varue', 'Hadu'	Simaroubaceae
13.	<i>Bridelia retusa</i> (L.) A. Juss.	'Asana'	Phyllanthaceae
14.	<i>Buchanania lanzan</i> Spr.	'Char', 'Charu', 'Charoli'	Anacardiaceae
15.	<i>Buchanania axillaris</i> (Desr.) Ramamoorthy	'Char'	Anacardiaceae
16.	<i>Bombex ceiba</i> DC.	'Simal', 'Sawar'	Bombacaceae
17.	<i>Butea monosperma</i> (Lam.) Taub.	'Bhahavi', 'Palas'	Fabaceae
18.	<i>Cassia fistula</i> Linn.	'Bahava'	Caesalpiniaceae
19.	<i>Careya arborea</i> Roxb.	'Kumbi', 'Kumbh'	Lecythidaceae
20.	<i>Cassine glauca</i> (Rottb.) O. ktze.	'Janrasi', 'Aran', 'Butyakalas'	Celastraceae
21.	<i>Chloroxylon swietenia</i> DC.	'Haldu', 'Bhirra'	Meliaceae
22.	<i>Cordia macleodii</i> (Griff.) Hook.	'Dhaian'	Cordiaceae
23.	<i>Dispyros chloroxylon</i> Roxb.	'Temru'	Ebenaceae
24.	<i>Dalbergia sissoo</i> Roxb.	'Sisam', 'Sissu'	Papilionaceae
25.	<i>Dalbergia latifolia</i> Roxb.	'Bijsa', 'Shisham'	Fabaceae
26.	<i>Dalbergia paniculata</i> Roxb.	'Phassi'	Fabaceae
27.	<i>Dalbergia lanceolaria</i> L	'Shisham'	Fabaceae
28.	<i>Delonix elata</i> (L.) Gamble.	'San-sada'	Caesalpiniaceae
29.	<i>Delonix regia</i> (Hook.) Raf.	'Gulmohar'	Caesalpiniaceae
30.	<i>Dolichandrone falcata</i> Seem.	'Medsing'	Bignoniaceae
31.	<i>Erythrina suberosa</i> Roxb.	'Pangara'	Fabaceae
32.	<i>Erythrina stricta</i> Roxb.	'Pangara'	Fabaceae
33.	<i>Embllica officinalis</i> Gaertn.	'Awa'	Euphorbiaceae
34.	<i>Eucalyptus globulus</i> Labill.	'Nilgiri'	Myrtaceae
35.	<i>Ficus religiosa</i> L.	'Pipal'	Moraceae
36.	<i>Ficus recemosa</i> L.	'Umber'	Moraceae
37.	<i>Ficus benghalensis</i> L.	'Wad'	Moraceae
38.	<i>Ficus amplissima</i> J.E. sm.	'Pipri'	Moraceae
39.	<i>Gmelma arborea</i> Roxb.	'Shivan'	Lamiaceae
40.	<i>Garuga pinnata</i> Roxb.	'Katula', 'kakad'	Burseraceae

41.	<i>Grewia tiliifolia</i> Vahl.	'Dhayn'	Tiliaceae
42.	<i>Haldina cordifolia</i> Hook. F.	'Hardu', 'Haldu'	Rubiaceae
43.	<i>Holoptelea integrifolia</i> (Roxb.) planch	'Papada'	Ulmaceae
44.	<i>Hardwickia binata</i> Roxb.	'Anjan'	Caesalpiniaceae
45.	<i>Lagerstroemia parviflora</i> Roxb.	'Bondara'	Lythraceae
46.	<i>Lamea coromandelica</i> Merrill.	'Moian', 'Moin'	Anacardiaceae
47.	<i>Lagerstroemia microcarpa</i> wight	'Girvada', 'Lendia'	Lythraceae
48.	<i>Linonia acidissima</i> L.	'Kaitha', 'Kait'	Rutaceae
49.	<i>Mangifera indica</i> Linn.	'Amba'	Anacardiaceae
50.	<i>Mitragyna parvifolia</i> (Roxb) Korth	'Kallam', 'kaddam'	Rubiaceae
51.	<i>Madhuca longifolia</i> (J.Konig) J.F.Macbr	'Mahu', 'Muhu', 'Mahuwa'	Sapotaceae
52.	<i>Memecylon umbellatum</i> Burm.	'Karap'	Melastomataceae
53.	<i>Milusa tomentosa</i> J.Sinclair	'Homb', 'Hoom'	Annonaceae
54.	<i>Ougeinia oofeinensis</i> (Roxb.) Hochr.	'Tinsa', 'Tiwas'	Fabaceae
55.	<i>Pongamia pinnata</i> (L.) Pierre	'Kanji', 'Karanj'	Fabaceae
56.	<i>Pterocarpus marsupium</i> Roxb.	'Bia', 'Bivla', 'Bhilava'	Fabaceae
57.	<i>Syzygium cumini</i> Lam.	'Jamun', 'Jambul'	Myrtaceae
58.	<i>Schleichera oleosa</i> (Lour.) Oken.	'Kusum'	Sapindaceae
59.	<i>Sterculia urens</i> L.	'Karai', 'Dhavarukh'	Sterculiaceae
60.	<i>Soymdia febrifuga</i> (Roxb.) A.Juss.	'Rohin', 'Rohan'	Meliaceae
61.	<i>Strychnos potatorum</i> L.	'Nirmoi', 'Nirmali'	Loganiaceae
62.	<i>Schrebera swietenoides</i> Roxb.	'Mokha'	Oleaceae
63.	<i>Terminalia belirica</i> Roxb.	'Behdu', 'Beheda'	Combretaceae
64.	<i>Terminalia arjuna</i> (Roxb. Ex DC.) Wight and Arm	'Kahu', 'Kahua', 'Arjun sadada'	Combretaceae
65.	<i>Tectona gaudis</i> L.F.	'Sag', 'Sagudu'	Lamiaceae
66.	<i>Terminalia crenulata</i> Roth.	'Ain', 'Sadada'	Combretaceae
67.	<i>Trema orientalis</i> (L.) Bl.	'Gol'	Ulmaceae
68.	<i>Terminalia chebula</i> Retz.	'Harda', 'Hirda', Harla	Combretaceae
69.	<i>Tamarindus indica</i> L.	'Chinch'	Caesalpiniaceae
70.	<i>Ziziphus glaberrima</i> (sedgew.) Sant.	'Ghatboor', 'Ghoti'	Rhamnaceae

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A Review on Bioactive Metabolites and Health Benefits of Brihatpilu (*Salvadora persica* L.): A Medicinally Important Plant

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ABSTRACT

Brihatpilu (*Salvadora persica* L.) of the family Salvadoraceae, and evergreen occurs in shrub savannah. It frequently used as a toothbrush and used in oral hygiene, medicine, cosmetics, food, fuel and even in pharmaceutical industries for preparation of 'Meswak' toothpaste. The present review gives a comprehensive outline of the bioactive chemical constituents and their health benefits of this species. The plant extracts are hopefully safe as evident from its ethonobotanical and ethnomedicinal studies, and exhibited various pharmaceutical effects such as antibacterial, analgesic, antioxidant, antigingival irritation, antiviral, antiulcer, anticonvulsant, antifungal, abortifacient, antiplatelet-agression, antifever, anti-ulcerogenic, anti-caries, antidepressant, hypolepidemic, and wound-healing.

Keywords: *Salvadora persica*, Meswak, Bioactive metabolites, Pharmaceutical effects.

I. INTRODUCTION

The present attempt is focused on bioactive metabolites of *S. persica* and their potential pharmaceutical applications. It is a multi-purpose medicinal plant of the genus *Salvadora* widely distributed in Asia and South Africa [1] and has been traditionally used for various ailments like anticonvulsant, antiulcer, gastric troubles, and sedative effects in different regions of the world [2,3,4]. In addition, very familiar administration of this plant is for dental hygiene which has been utilized for centuries in some countries, a practice also supported by World Health Organization [5,4].

Nowadays, a rising interest in the use of natural products, principally those derived from plants has been clear. Kind of reasons are behind this interest of plant produced compounds, number of plants are remain unscreened for chemical compounds and biological effects and long back history of traditional system of medicine imply safety and efficiency of natural products use and also specified pharmaceutical targets [6]. The beneficial effects of meswak in oral hygiene and dental health are partially due to its mechanical action and principally due to pharmacologic effect from its composition of different bioactive metabolites [2]. For instance, presence of benzyl-isothiocyanate from roots of *S. persica* contains alkaloids, β -sitosterol, and small amount of resins, m-anisic acid, saponins, salvadourin, tannins, and trimethylamine constituents reported by [2].

II. DESCRIPTION OF *S. persica*:

Salvadora persica, belongs to Class Magnoliopsida (family: Salvadoraceae) commonly known as Pilu, Bhrihatpilu, and Meswak and 10 species distributed mainly in the tropical and sub-tropical regions of Africa and Asia [7]. It is a medium-sized tree or shrub with long and drooping branches, warped trunk, seldom more than 0.3 – 0.5 m in diameter [8]. The leaves are glabrous, lanceolate, sub-succulent, 3–10 cm long, 1–3 cm wide, rounded to acute at apex, cuneate to sub-cordate at base [9]. The plant has a pleasant smell and pungent taste. Flowers are small, greenish–white with lateral and terminal panicles up to 10 cm long. Fruits are drupes, red to dark red purple in colour, aromatic, edible, and slightly sour in flavor, sweet on ripe, and with or without seeds contain pale-yellow solid fat, lauric and myristic acid, and 1.7–1.9% sugars on ripe [8,9]. Additionally, pale-yellow solid fat, rich in lauric and myristic acids which is used in the preparation of soaps, illuminants, varnishes, paints as well as in food industry and it is recognized as nonconventional oil seed tree [9].

III. BIOACTIVE METABOLITES

Under phytochemical investigation, all the parts (root, stem, leaves, and fruits) of *S. persica* have been screened (Table 1). An extensive bioactive metabolites analysis revealed the presence of alkaloids, flavonoids, furans, glycosides, phenolics, sterols, saponins, tannins, and terpenes consists of α -caryophyllene, β -pinene, Benzyl isothiocyanate, 1,8-cineole, D-limonene, linalool, liriiodendrin, lauric acid, m-anisic acid, myristic acid, persicaline, palmitic acid, salvadoricine, salvastearolide, salvadoura, salvadoside, salvadoraside, syringin, and quercetin[6] (Fig. 1). The recent studies have reported some additional identified metabolites from Meswak like butanediamide, N1, N4-bis(phenylmethyl)-2(S)-hydroxybutanediamide(I), N-benzyl-2-phenylacetamide (II), N-benzylbenzamide (III), oleic, linolic, and stearic acids, benzyl nitrile, eugenol, thymol, isothymol, eucalyptol, isoterpinolene, fluoride, thiocyanate, trimethyl amine, saponins, sterols, lignan glycosides, rutin, and quercetin etc. The principal metabolite from the essential oil of Meswak stem have been identified as 1,8-cineole (eucalyptol) (46%), α -caryophellene (13.4%), β -pinene (6.3%), and 9-epi-(E)-caryophellene[6,7,10,11].

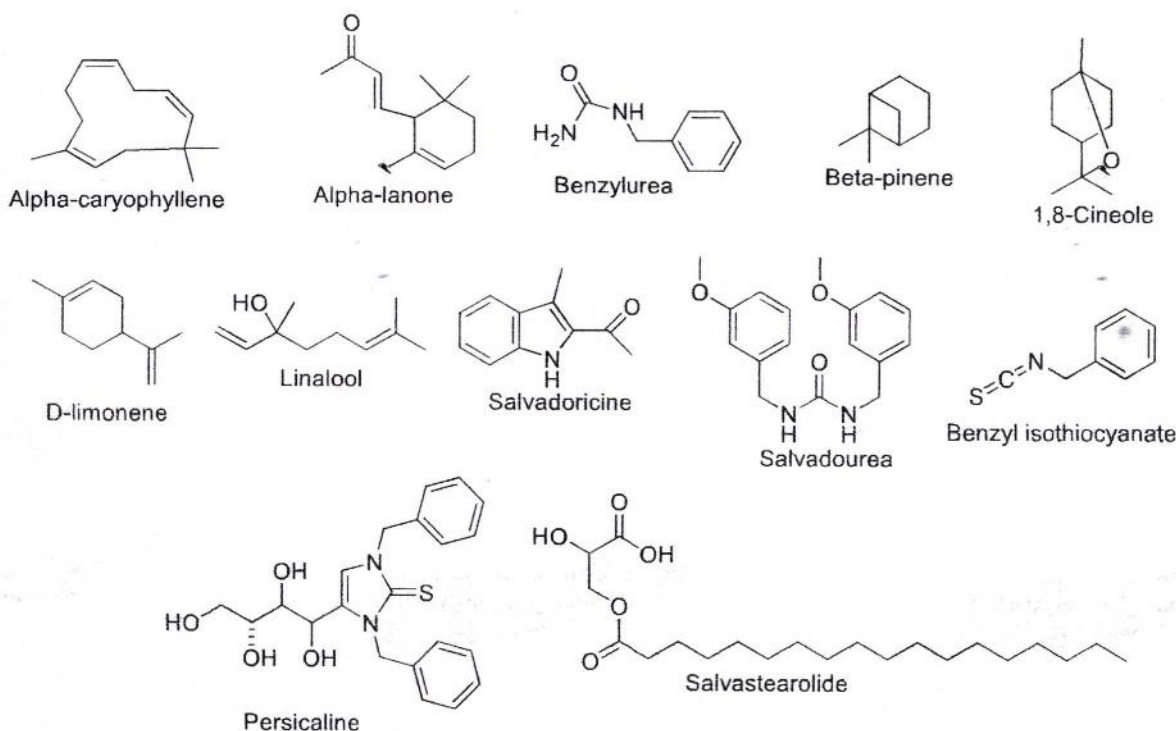


Fig. 1 Phytochemical constituents of *Salvadora persica*

IV. PHARMACEUTICAL ACTIVITIES

A. Antibacterial activity

Several studies have reported that root, stem, leaves, and fruits of *S. persica* possess bactericidal effects. Likewise, El-Hefny et al.[10] has reported the potential antibacterial effects of leaf, stem and root wood extracts of *S. persica* against phytopathogenic bacterial strains such as *Bacillus pumilus*, *Dickeya solani*, *Enterobacter cloacae*, *Pectobacterium caratovorum* (ippbc038), and *Ralstonia solanaceum* by using the disc diffusion method. Previous reports suggested that, *S. persica* exhibited significant antibacterial activity against both aerobic as well as anaerobic bacteria collected from teeth by different researchers in the various parts of the world. For instance, *S. persica* aqueous extracts were effective against *Streptococcus mutans* and *Streptococcus faecalis*[7,12,13]. The strongest bacterial action was recorded using the aqueous extract against *S. faecalis* (ZOI: 22.3 mm; MIC: 0.781 mg/ml) and the extract of *S. persica* is found to be effective against bacterial pathogens such as *S. pyrogenis*, *S. faecalis*, *P. aeruginosa* and *Lactobacillus acidophilus*[7,14,15]. Sharma et al.[9] has evaluated the bactericidal potential of aqueous extract of *S. persica* against growth of *Candida albicans*, *Streptococcus* sp. and *Staphylococcus aureus* that may be associated to its high sulfate composition. Moreover, *Enterococcus faecalis* is the most sensitive microorganism affected by the use of aqueous extracts of *S. persica*, and it is



noticed that no significant difference was recorded in the antibacterial effects of freshly cut and 1-month-old stems. The antibacterial activity of methanolic extract (200mg/ml) of arial part of *S. persica* against bacteria (*S. aureus* and *Streptococcus sp.*) isolated from dental plaque of patient [16].

B. Analgesic effect

Khatak et al. [2] has reported the analgesic activity of *S. persica* decoction when injected into mice. They observed that *S. persica* decoction was found more effective against thermal stimuli than chemical stimuli. Hooda and Pai [17] has studied analgesic effects of hydroalcoholic root extract of *S. persica* on albino mice and albino rat model using Eddy's hot plate (400 mg/kg orally for 90 minutes) and tail immersion methods (400 mg/kg orally for 90 minutes), respectively.

C. Hypolipidemic activity

The stem sticks of *S. persica* are widely used in oral hygiene and stem decoctions exhibit reduction in cholesterol composition in human being. Use of *S. persica* decoction tested in diet induced hypercholesterolemic rats. The results showed that, the *S. persica* decoction significantly lowered cholesterol and LDL plasma levels in the rats, proving to be the decoction possess hypolipidemic effect. Khatak et al. [2] has evaluated influence of decoction prepared from *S. persica* was found to be significantly effective (27 hrs treatment) for the reversal of increased plasma cholesterol and triglyceride levels induced by Triton.

D. Hypoglycemic activity

On consideration of presence of phytochemical constituents of Meswak, administration of various extracts of Meswak in rats exhibited potential hypoglycemic effect [18].

E. Anti-inflammatory activity

Ahmad et al. [7] has reported strong anti-inflammatory action on exposure of *S. persica* extracts to the two different groups of Albino rats (Male & Female). The extracts and standard drugs are orally administered an hour prior to carrageenan injection. Indomethacine was used as standard component. Rao et al. [19] has studied anti-inflammatory effect of *S. persica*. The study reported that, the better anti-inflammatory action in the 4 hr treatment after the administration of ethanolic extract of *S. persica* sticks in rats inflammation induced by standard drug aspirin with 500 mg/ml dose [20].

F. Anticancer activity

Kumar and Sharma [21] has evaluated oral anticancer activity (PE/-CA-PJ15 and PDC fibroblast cancer cell line) of aqueous extract of *S. persica* which results in the cytotoxicity effect becomes significant at 11.25mg/ml concentration of plant extract. Aqueous, acetone and ethanolic extracts of leaves, bark, and fruit peels of *S. persica* exhibited potential anticancer activity was evaluated using the HeLa cell line. Among all the tested extracts, ethanolic leaves extract was found to be the best for anticancer potential of *S. persica* [19,21]. The effect of aqueous and methanolic extract of *S. persica* stem was evaluated as antitumor agent and as a result, tested extracts of *S. persica* was indicated significant antitumor activity at 400µg/ml concentration [22]. Iyer and Patil [23] have evaluated in vivo antitumor potential of isolated antitumor agent coumarin from *S. indica* stem in hybrid mice model (Swiss albino strain and C57BL strain). The results showed that, tumor growth was delayed by enhancing volume doubling time, growth delay, and mean survival time. The root extract of *Salvadora persica* exhibited potential anticancer action against human hepatoma (HepG2) cancer cell line and also showed positive impact in the treatment of hepato-cellular carcinoma in human [24].

G. Antiulcer activity

Decoction of *S. persica* possessed showed significant protective activity against ethanol and stress-induced gastric mucosa ulcers in rats was evaluated by using optical microscopy [8]. Labeda et al. [11] have evaluated the protective effect of *S. persica* root extract (dose 200 mg/kg and 400mg/kg) against chilled absolute ethanol (dose, 5 ml/kg) induced gastric ulcer in the male adult rat. The root decoction (500 mg/kg) of *S. persica* exhibited antiulcer effect against acetyl salicylic acid (200 mg/kg for three days treatment) induced ulcer in male Wistar rat. The results showed that the ulcer index of treated rats was decreased by 11.4 ± 2.3 to 0.9 ± 1.6 and confirmed using microscopic studies [21,25].

H. Anticonvulsant activity

The stem extracts of *S. persica* was showed anticonvulsant effect on rats. The extracts of *S. persica* extended sleeping-time



and decreased induction-time induced by sodium pentobarbital; also exhibited protection against PTZ-induced convulsion by increasing the latency period and diminishing the death rate in mice[8]. Likewise, Khatak et al. [2] has studied the effect of stem extract of *S. persica* exhibited anticonvulsant effects, thereby stem extracts showed protection against PTZ-induced convulsion by increasing the latency period and declining mortality rate in rats.

I. Antifungal activity

Fungicidal effect of Meswak extracts at concentration of 15% and above for maximum 48 hours of exposure. The significant fungicidal potential of Meswak extracts exhibited was probably due to presence of one or more root metabolites includes alkaloid resin, trimethylamine, and sulfur compounds is reported by Al-Bagieh et al. [26]. Likewise, the diluted acetone extract (300 mg/ml) of dry *S. persica* showed significant results against oral fungal infections caused by *C. albicans*, *C. glabrata* and *C. parapsilosis* strains screened by using disc diffusion and micro-dilution assays [7].

J. Abortifacient activity

The extract of *S. persica* did not have much effect on female mice fertility, although it caused a significant decrease in the relative weights of the ovary and an increase in the weights of uterine. The results indicate that, the extract of *S. persica* has adverse effects on male and female reproductive systems and fertility [8]. Darmani et al. [27] and Kumar and Sharma [21] has reported that, the antifertility effect of ethanolic extract of *S. persica* sticks (oral dose 800 mg/kg of extract for 30 days) on the fertilization of male and female mice. Treated male mice resulted in an increase in weight in testes and preputial glands and decreased in seminal vesicles. Treated females resulted in a decrease in ovary weight and an increase in uterine weight and no change in embryo weight. The study claimed that the number of pregnancies in females impregnated by the treated male was decreased to compare with control male.

K. Cytotoxicity effect

Literature survey suggested that, extracts of *S. persica* showed cytotoxic potential on gingival and other periodontal structures and no cytotoxic effect has been exhibited by a freshly cut and freshly used *S. persica*. Based on these research findings it is suggested that the used portion of the *S. persica* should be cut after it has been used for a day [8]. The cytotoxic effect of plant extracts became evident only after 24h exposure because the agar overlay method depends on the dispersion of the extracts to the agar medium [2].

Table 1. Biologically active metabolites composition of *Salvadora persica*

Compound	Biological activity	References
Tannic acid	Reduces the clinically detectable gingivitis and plaque and gingivitis	[7,28,29,33]
Benzyl isothiocyanate, benzyl nitrile, carvacrol, benzaldehyde, aniline and naphthalene	Dental hygiene effects	[7,30]
Salvadorine	Antibacterial effect and stimulatory action on the gingival	[7]
Benzyl nitrate and Benzylisothiocyanate	Antiviral, antibacterial and anti-fungal agents	[7,31]
Butanediamide, N4-bis(phenylmethyl)-2(S)-hydroxybutanediamide	Antibacterial agent against gram positive and gram negative bacteria	[32]
N-benzyl-2-phenylacetamide	Antiplatelet aggregation effect in human, and antibacterial activity against <i>E. coli</i>	[7,32]
Alkaloids	Antimicrobial agents	[6]
Flavonoids		[6,33]
Glycosides	Antimicrobial agents	[7]
Phenolics		[6,33]
Saponins	Antimicrobial agents	[6]
Terpenes	Antimicrobial agents	[6,7]

Salvadourea, m-anisic acid	Anti-viral, antiparasitic activity	[8,34]
Octacosanol, Triacantanol, β -sitosterol, Glucopyranoside	Antimicrobial, analgesic, anti-fertility, sedative, antiulcer effects	[8]
Lauric, myristic and palmitic acids, phenols, furans, sterols, glycosides, salvadoside, salvadoraside, syringin, lirioidendrin, Quercetin, and flavonoids rutin	Antimicrobial action	[7]
α -caryophyllene, Benzyl isothiocynate, Linalool, D-limonene, salvadoricine, persicaline, salvastearolide, β -pinene, 1,8-cineole, salvadourea	Wound-healing, antioxidant, analgesic, anti-inflammatory, sedative, and antidepressant effects	[6]

CONCLUSION

Bioactive metabolites composition and pharmaceutical activities of various parts of *Salvadora persica* (Meswak) were analyzed. Depending upon the phytochemical constituents, the *S. persica* has distinctive health advantages. The present study suggests that different parts of *S. persica* is a potential source of various bioactive metabolites and has promising pharmaceutical effects. Moreover, the potential antibacterial, analgesic, antioxidant, anti-gingival, antiviral, antiulcer, anticonvulsant, antifungal, abortifacient, antiplatelet-aggression, antifever, anti-ulcerogenic, anti-caries, antidepressant, hypolepidemic, and wound-healing activities of the various parts extracts of *S. persica* may be attributed for the presence of α -caryophyllene, β -pinene, Benzyl isothiocynate, 1,8-cineole, D-limonene, linalool, lirioidendrin, lauric acid, m-anisic acid, myristic acid, persicaline, palmitic acid, salvadoricine, salvastearolide, salvadourea, salvadoside, salvadoraside, syringin, and quercetin. This study demonstrates the presence of alkaloids, phenolics, furans, sterols, glycosides, flavonoids metabolites which brings out the nutritional potential of the plant for overcoming the nutritional deficiency and future research would consider large scale cultivation is recommended on the basis of its high medicinal potential. Furthermore, the higher phytochemical composition and potential biological activities of the plant extracts might be exploited in the pharmaceutical industries as medicines.

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Comparative, Quantitative HPTLC Analysis of Solasodine from In Vivo And In Vitro Leaf Sample of Solanum Virginianum L.

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ABSTRACT

Solanum virginianum L. is an important medicinal plant belongs to family Solanaceae. It is effective on Gonorrhoea, Bronchial asthma, tympanitis, misperistalsis, Piles, Dysuria and for Rejuvenation in ayurveda. In this plant various types of important secondary metabolites is presents like Solasodine, Rutin, Ellagic acid and Diosgenin. During the present investigation efforts have been made to evaluate standard protocol for quantitative analysis of secondary metabolite solasodine from in vivo and in vitro leaf samples of *Solanum virginianum* L. by using HPTLC technique. In vitro leaf was grown by using tissue culture technique by using MS media and different growth hormones like auxin (IAA, IBA) and Cytokinin (BAP, KIN) in various quantities (mg/l).

Keywords: HPTLC, Solasodine, in vivo, in vitro, MS media, metabolites.

I. INTRODUCTION

Solanum virginianum L. is an important medicinal plant in ayurvedic medicines belongs to family *Solanaceae*. It is commonly known as yellow berried nightshade, and in Marathi Bhuirngani or Ran Wangi. The genus *Solanum* is comprised of about 1500 species and well represented all over the world.

Description and distribution of plant: It is native to Asia (Saudi Arabia, Yemen, Afghanistan, Iran, China, Bangladesh, India, Nepal, Pakistan, Sri Lanka, Myanmar, Thailand, Vietnam, Indonesia and Malaysia) and is adventives in Egypt. In India it is recorded in tropical, subtropical and all four geographical regions. Frequently it has been considered as weed plant but in Ayurveda and folklore medicine since time immemorial there are meagre reports in literature about its other potentials (Madhavi *et al.*, 2014).

Morphologically *Solanum virginianum* is prickly diffuse bright green perennial herb, somewhat woody at the base while stem is zigzag, branches are numerous. The younger ones clothed with dense stellate tomentum.

Medicinal and chemical properties: In ancients Ayurveda, plant is described as pungent, bitter, digestive, alternative astringent. Stems, flowers, fruits are bitter and contains carminative properties. Root decoction used as febrifuge, effective diuretic and expectorant. Charaka and Sushruta used the extract of entire plant and fruits in internal prescription for bronchial asthma, tympanitis, misperistalsis, piles and dysuria and for rejuvenation.

Kantkari Ghrita of Charakais was specific for cough and asthma. The whole plant is used traditionally for curing various ailments (Atul *et al.*, 2013).

Decoction of the plant is used in gonorrhoea; paste of leaves is applied to relieve pains. Seeds act as expectorant in cough and asthma and roots are expectorant and diuretic. They are useful in the treatment of catarrhal fever, coughs, asthma and chest. *Solanum virginianum* is a well-known medicinal plant in traditional medicinal system and recent scientific studies have emphasized the possible use of *Solanum virginianum* in modern medicine (Reddy *et al.*, 2014). Chemically Okram and Thokchom (2010) reported it is a valuable source of alkaloids, sterols, saponins, flavonoids and their glycosides and also carbohydrates, fatty acids, amino acids (Gnana *et al.*, 2013).

Plant tissue culture and phytochemical analysis:

Plant tissue culture techniques are playing an important role in the enhancement of secondary metabolites. Plants possess several bioactive elements which are used to treat several diseases of human and animals. Phytochemicals are metabolic products which are of two types i.e., primary and secondary metabolites. Primary metabolites include proteins, amino acids, chlorophyll and carbohydrates. Secondary metabolites of this plant include alkaloids, sterols, phenolics and terpenoids. Ethanomedicinal reports of this plant indicate that this plant contains antifungal, antibacterial and anti-inflammatory activities (Pandey and Singh, 2014).

Solasodine is an alkaloid which occurs as an aglycone part of glycoalkoid, which is a nitrogen analogue to sapogenins. It is a steroidal alkaloid based on a C 27 cholestane skeleton. Solasodine has diuretic, anticancer, antifungal, cardiogenic, antispermato genetic, antiandrogenic, immunomodulatory, antipyretic and having various effects on central nervous system (Patel *et al.*, 2013).

II. MATERIALS AND METHODS

Surface sterilization of explant: Explants viz. leaves and stem node were collected from different localities of University campus of Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. All explants were washed with tap water twice in laboratory, followed by 70% ethanol for 30 seconds and then surface sterilized with HgCl₂. Surface sterilization of explant was carried out in laminar air flow. Explants were rinsed with sterile distilled water followed by 0.3% Mercuric chloride (HgCl₂). Finally all these explants were dissected into small pieces and inoculated on MS medium aseptically.

Culture media: For induction of shoot Murashige and Skoog media (MS) (1962) was used for stem node and leaf explants of *S. virginianum*. Stem node and leaf were inoculated on MS medium supplemented with different concentrations of auxins IAA with combinations of cytokinin BAP and KIN for shoot induction. MS medium fortified with 3% sucrose and gelled with 3 gm/L clarigard and the pH was adjusted to 5.8. The media was sterilized in an autoclave under 15 psi and 121°C.

Culture condition: After inoculation culture bottles were transferred to culture room under a 16 h photoperiod supplied by cool white fluorescent cool tubes light and temperature 25± 2°C. Maximum humidity was adjusted with air conditioner. Each experiment set in three sets, five of each.

Biochemical analysis (HPTLC): It has been learnt that *Solanum virginianum* contains secondary metabolites from the group of alkaloids, flavonoids, tannins and saponins. For the detection of these secondary metabolites, HPTLC analysis of plant material was carried out during the present work. Modern high-performance TLC (HPTLC) is an efficient instrumental technique and the optimized Quantitative HPTLC by using a densitometric evaluation, can produce results that are analogous to those obtained with GC and HPLC. The chromatographic technique such as gas chromatography (GC) or high-performance liquid chromatography (HPLC), which now a days are used considered could be as the leading techniques for undertaking the biochemical work (Gupta *et al.*, 2012).

Biochemical analysis can be carried out through the qualitative and quantitative measurements. The present investigations were aimed to enhance the secondary metabolites in plants as they were growing under stress conditions in the tissue culture laboratory. GCMS and MS were utilized to screen the qualitative aspects while the HPTLC technique was frequently used to screen the quantitative aspects of secondary metabolites. All ayurvedic plants have secondary metabolites like alkaloids, tannins, phenolics, flavonoids and terpenoids present in them. It was felt that a detailed biochemical work of such secondary metabolites in the present work would throw a good amount of light on their medicinal capabilities and utility aspects as well.

III. PREPARATION OF PLANT EXTRACT

The *in vivo* leaf sample of *Solanum virginianum* were collected from the campus Dr Babasaheb Ambedkar Marathwada University Aurngabad, *in vitro* leaf sample was collected from the tissue culture laboratory Department of Botany Dr BAMU Aurangabad. Both the samples were cleaned and shade-dried were considered for testing of secondary metabolites. The each dried part of *Solanum virginianum* was pulverized by a mechanical grinder and passed through a 20-mesh sieve. Powdered samples (5gm) were separately extracted with ethanol using a Soxhlet apparatus. The extraction was carried out for 24h at room temperature with mild shaking. The extracts were filtered and concentrated at 35°C (Kameshwara *et al.*, 2003). It was used for further analysis of HPTLC at Institute of Science, Mumbai.

Chemicals and reagents:

Standard secondary metabolites solasodine was purchased from Sigma-Aldrich Chemical Co. besides the petroleum ether anisaldehyde, sulphuric acid and HPLC grade ethanol. All the organic solvents and chemicals used for extraction during the study were of analytical grade (A.R. grade) obtained from S.D. Chem. Pvt. Ltd., Mumbai, India.

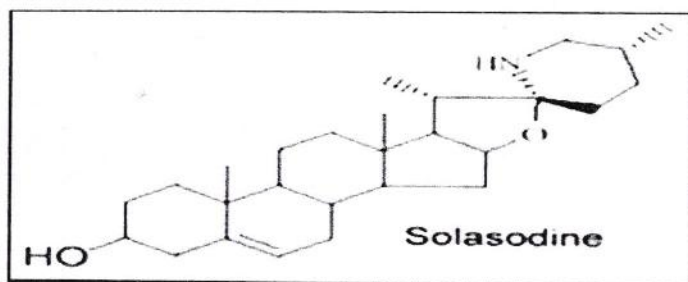


Fig A: Structure of Solasodine

HPTLC quantification in test samples

Samples

Sample R1- *in vivo* leaf, R2- *in vitro* leaf and standard Solasodine.

Test solution preparation

The ethanol extract of *S. virginianum* was weighed in electronic balance and dissolved in ethanol and kept for ultra-sonication at 100 rpm for 25 minutes. This solution was used as test solution for HPTLC analysis.

Mobile phase

Solasodine: - Toluene: ethyl acetate: formic acid: methanol in the volume ratio of 12:9:4:0.5.

Sample application

20µl of test solution and 2 µl of standard solution were loaded as 8mm band length in the 20 × 10 silica gel 60F₂₅₄ TLC plate using Hamilton syringe and CAMAG LINOMAT – 5 instruments.

Spot development

The sample loaded plate was kept in TLC developing chamber and the plate was developed with respective mobile phase.

Photo – documentation

The developed plate was dried by hot air to evaporate solvents from the plate the plate was kept in photo-documentation chamber (CAMAG TLC Scanner) and captured the image at White light, UV 254nm and UV 366nm.

Derivatization

The developed plate was sprayed with anisaldehyde – Sulphuric acid reagent dried at 100° C in hot air oven. The plate was photo – documented in white light and UV 366nm mode using photo-documentation (CAMAG visualiser) chamber.

Scanning

After derivatization, the plate was fixed in scanner stage and scanning was done at UV 366nm. The peak table, peak display and peak densitogram was noted.

IV. RESULT AND DISCUSSION

HPTLC fingerprinting profile comprises a very important methodological approach of herbal drug standardization for the proper identification of medicinal plants and quantitative analysis of secondary metabolites. Solasodine is an important starting material for partial synthesis of steroidal hormones, it acts as a potent for biological, physiological and antimicrobial activity (Barbosa-filho *et al.*, 1991).

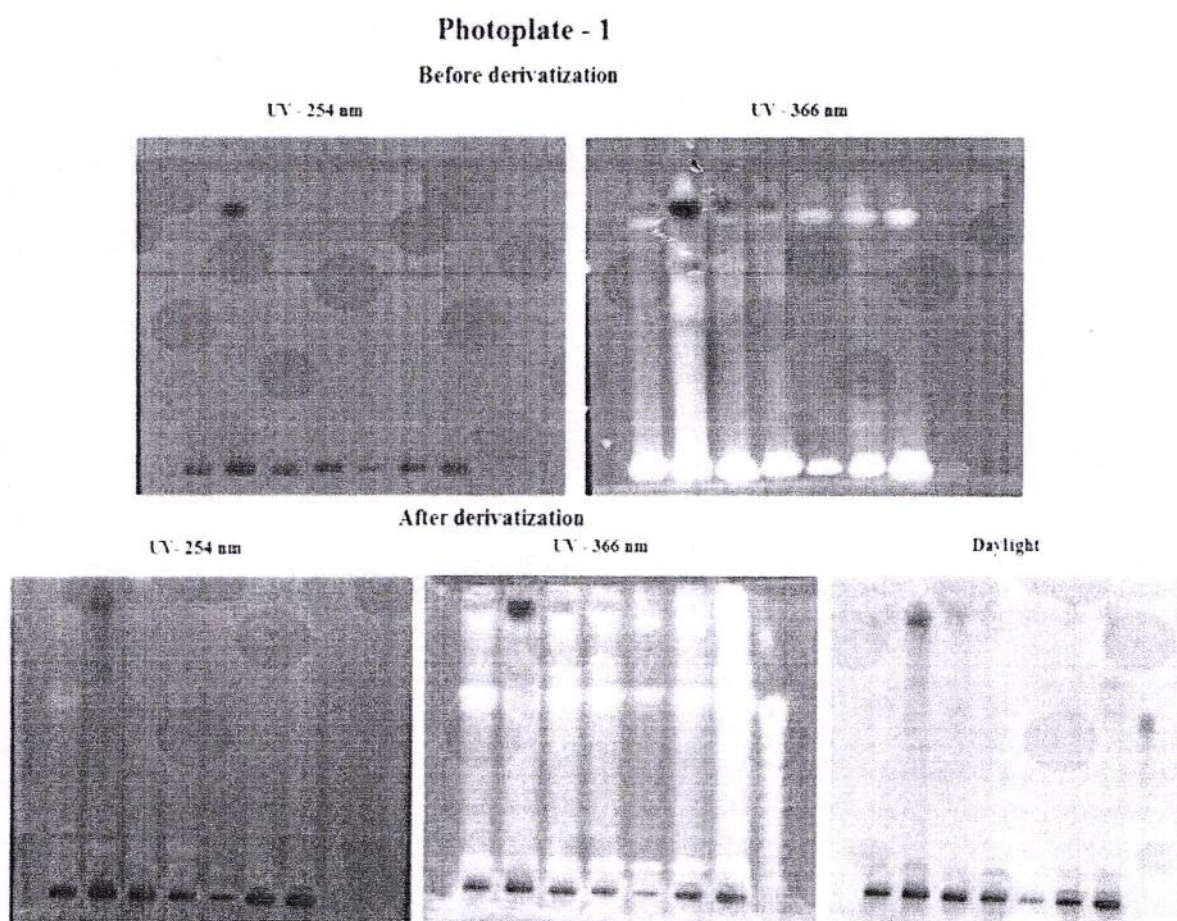
Gangwar *et al.*, (2013) undertook the phytochemical screening and studied the analgesic activity of Kantkari through TLC, HPTLC, IR and NMR techniques and observed the secondary metabolite solasodine to be present in different plant parts of the kantakari plant.

The HPTLC analysis for the solasodine compound *in vitro* and *in vivo leaf* samples showed good results and separation (Fig., B and C). The extracts were spotted on HPTLC plate and developed using toluene: ethyl acetate:

formic acid: methanol in the volume ratio of 12:9:4:0.5 resulted in good separation of the solasodine. TLC plate was observed under UV light for the presence of solasodine, this was detected by prominent dark brown spots (Photoplate, 1). The R_f value (0.62) for solasodine in both sample (Fig., B and C) and reference standard (Fig., D) was found comparable under UV light at 366 nm (observation - 1).

From the standard calibration curved of solasodine (Fig., D), the maximum amount was obtained in the *in vitro* grown leaf extracts yielded $0.0616 \pm 0.02 \mu\text{g/ml}$ of solasodine and in the *in vivo* leaf extracts, $0.0102 \pm 0.06 \mu\text{g/ml}$ of solasodine. (Table-1).

HPTLC analysis of various *in vitro* and *in vivo* leaf samples of *Solanum virginianum* revealed the presence of solasodine in both analysed samples.



HPTLC - Photodocumentation for Calibration of *in vitro* and *in vivo* sample for solasodine

Fig: B. HPTLC - Densitogram of *in vitro* leaf for solasodine.

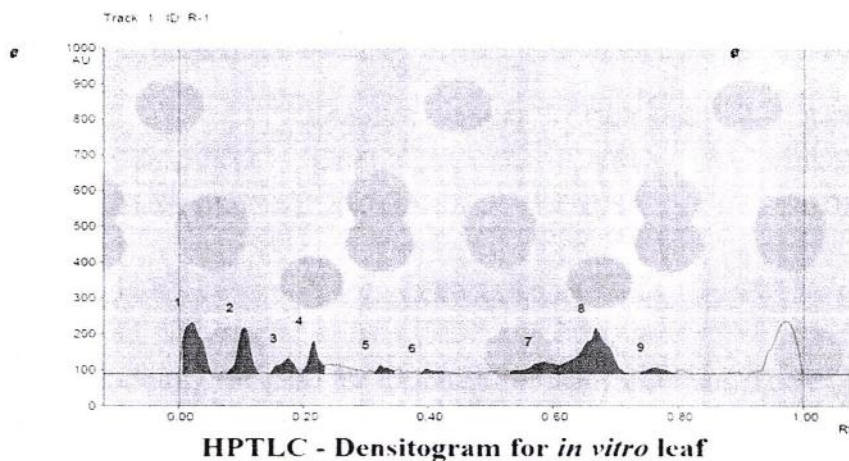


Fig: C. HPTLC - Densitogram of *in vivo* leaf for solasodine.

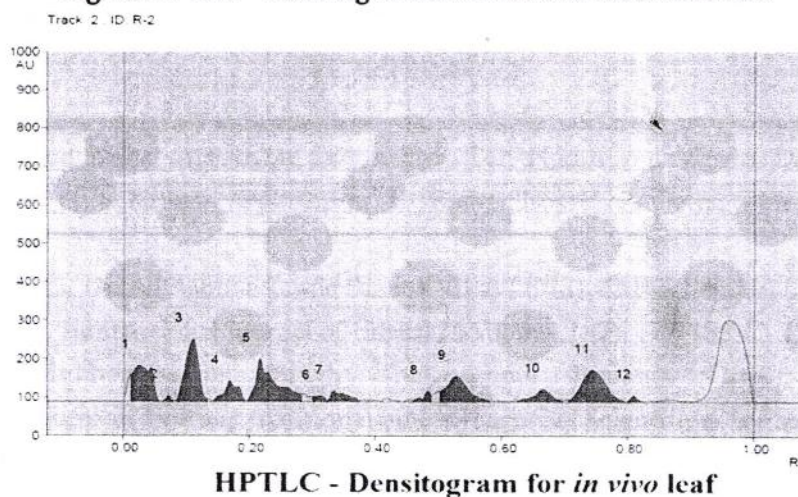


Fig D: Calibration curve for standard solasodine.

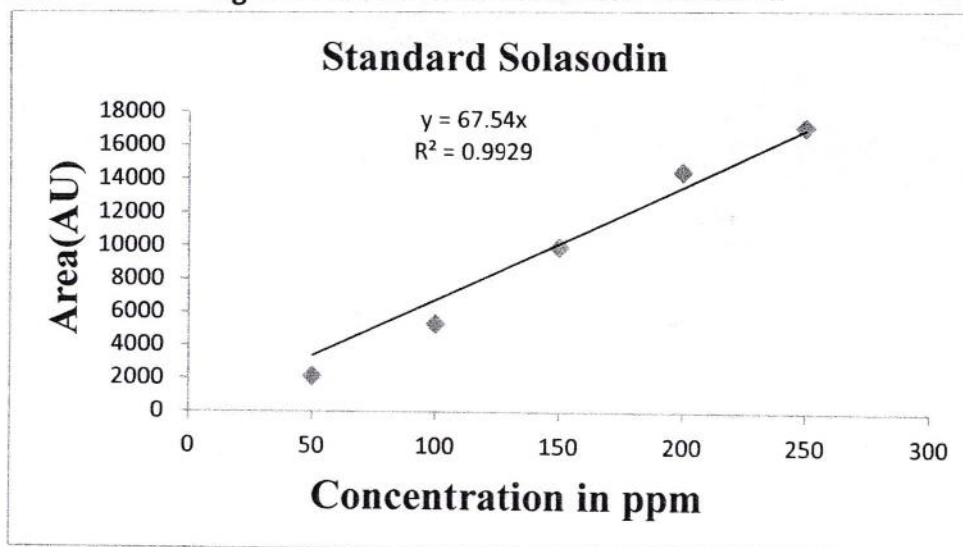


Table: 1. Quantitative HPTLC analysis of solasodine from *in vitro* and *in vivo* leaf samples of *Solanum virginianum*.

Sr. No.	Sample	Applied quantity	Peak area	Solasodine in μg
1	<i>In vitro</i> leaf powder (R1)	20.0 μl	4163	0.0616
2	<i>In vivo</i> leaf powder (R2)	20.0 μl	695	0.0102

V. CONCLUSION

Medicinal plants are voraciously collected for treatments of many disorders. These plants are bioreactors. If these plants propagated through modern techniques like tissue culture, raw Material could be utilized for therapeutic purpose. Present piece of work is useful for the study of comparative quantitative HPTLC analysis for different *in vivo* and *in vitro* samples of medicinal plants.

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Soybean Response to Biological and Chemical Fertilizers

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ABSTRACT

The field trial was conducted to investigate the effect of organic and inorganic Fertilizers on the growth of leguminous crop viz., soybean. The experiment was carried out in a Randomized complete Block Design (RCBD) and field trials were carried out in triplicates. The variety Mahabeej was used for trial. The fertilizers treatments comprised of five type's viz., Urea, 18-18, 12-32-16, FYM, poultry manures, Compost manures and control crop was not provided any fertilizer treatment. The result showed that poultry manures+18-18 and FYM +18-18 fertilizers had significant effect on Biochemical analysis (Crude Protein, Crude Fat, Crude Fiber, Nitrogen free extract, Acid Insoluble Ash and Total Carbohydrates,) at 30, 60, and 90 days after sowing. FYM+18-18 fertilizers had significant effect on Biochemical Analysis in comparison with untreated crop.

Keywords: Poultry Manures, Compost Manures, Yield Production, Inorganic Fertilizers, Control crop.

I. INTRODUCTION

Soybean (*Glycine max* L.) is considered as a wonder crop of 21st century which is the top oil seed in the world production. It is an important oil seed crop in addition to source of food, feed and nutrition (Imkongtoshi and Gohain, 2009). Organic fertilizers not only improve the soil physical and biological properties, also improved the efficacy of chemical fertilizers (Alam et al., 2010). Application of organic manure not only produced the highest and sustainable crop yield, but also improves the soil fertility and productivity (Sanwal et al., 2007). FYM provides essential macro and micro-nutrients, improves soil physical, chemical and biological environment by which it increases crop yield (Sangashetty, 2006). Nitrogen should be applied to a crop at times that avoids periods of significant loss and provide adequate N when needed. Soybean nitrogen (N) requirements are met in a complex manner, as this crop is capable of utilizing both soil N (mostly in the form of nitrate) and atmospheric N (Through symbiotic nitrogen fixation) (Vera et al., 2002). Manure is a readily available organic source of essential plant nutrients. It is used primarily as a source of plant nutrients (Mullins et al., 2002). Soybean being a highly nutrient-exhaustive legume requires higher amounts of nutrients, particularly P and K for its optimum production (Hasan, 1994). While application of

nitrogen fertilizer is not common for soybean crop, it is believed that the ability of soybean plant for fixing air N₂ to meet nitrogen requirements and maximum yield production is not enough (Wesley et al., 1998).

II. MATERIAL AND METHODS

The present work entitled "Effect of Various Fertilizers on the Growth and Yield of Soybean and Jowar" was carried out, during three consecutive Rabi seasons in the year 2016 to 2018 at the Department of Botany Sawarkar Mahavidyalaya, Beed. The experimental plots were laid out in a Randomized Complete Block Design (RCBD). Two plants were selected one from leguminous (Soybean) and other from non-Leguminous (Jowar). The Square plots were allocated with three organic and other inorganic Fertilizers viz., Application of farmyard manure (FYM= 10t/ha) Application of Poultry manure (PM), Application of Compost manure (CM= 2.5ton/ha) and Applications of recommended doses of chemical fertilizers i.e. Urea: 46% N (N= 180kg/ha), phosphorus and potassium. The experimental crop seeds were sown using single row hand drill on well prepared seeds. The quantity of FYM and PM to be added was calculated according to Rashid and Memo (2001). The quantity of phosphate (P), nitrogen and Urea in the respective plots before sowing and remaining at the time of sowing was applied. All other agronomic practices were kept normal and uniform. These fertilizers treatments were designated as F1 to F14 respectively.

The soybean variety (Statbeej DS 228) was cultivated for three seasons to observe the effects of different organic and inorganic fertilizers. The effects of FYM, poultry manure, chicken manure, compost manure and inorganic fertilizers (Nitrogen (N), phosphorus (P) and potassium (K) on the treated and control plants were observed. The chemical composition of *soybean* calculated for three seasons has been given in the (Table No. 10). The results of the study (2016) application of organic and inorganic fertilizers significantly showed an increase in yield, crude protein and crude fibers, total ash and acid insoluble ash over the control.

III. RESULT AND DISCUSSION

Table 10: Effect of organic and inorganic fertilizers on Control and Treated *Soybean* crop (2016)

Treatments		Difference
Control	Treated	
15	17.30	1.15%
20	31.85	2.25%
25	3.90	0.40%
30	30.30	1.8%
35	15.20	0.10%
40	6.80	0.50%
45	18.75	4.55%
50	49.05	2.72%

In the first year (2016), the dry matter (DM) in treated *soybean* was 17.30% while in control it was 16.15%. The crude protein content of control and treated was 29.60 and 31.85 respectively. Crude fat (Cfat) concentration in control and treated was 3.50 and 3.90. The crude fibre (CF) from treated and control 30.30 and 28.50. The total ash was 15.20 and 15.10 respectively. Acid insoluble ash was calculated and was 6.80 and 6.30 from treated and control. Nitrogen free extract was calculated and that was 18.75 from treated and 23.30 from control. The total carbohydrate measured and was 49.05 and 51.80 from treated and control plant respectively.

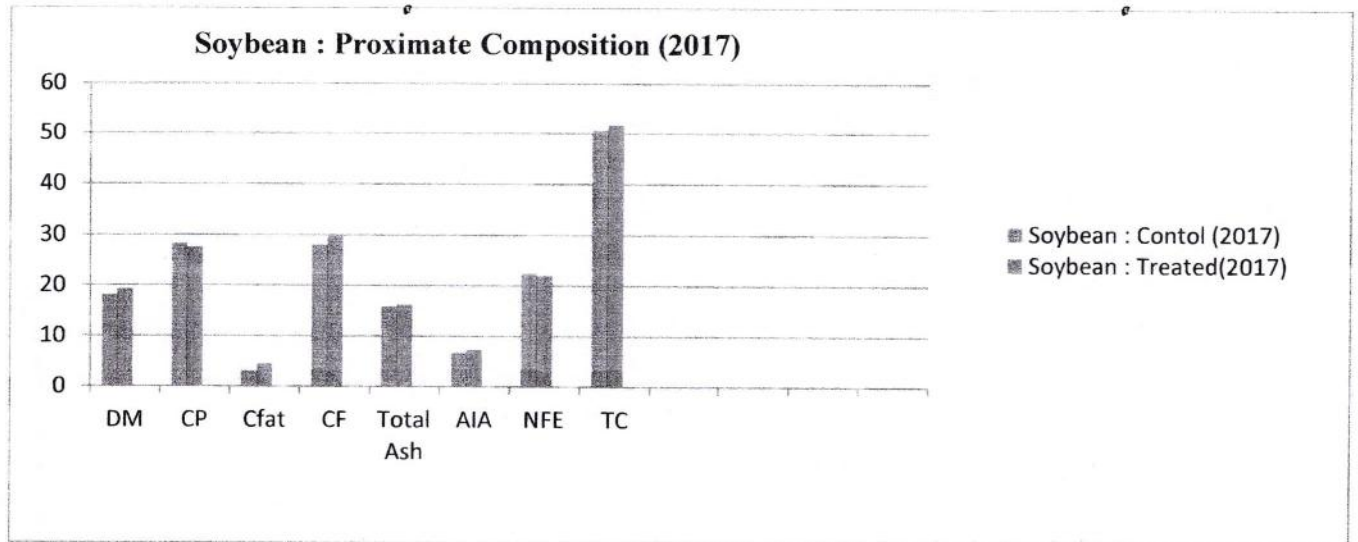
Table No. 21: Effect of organic and inorganic fertilizers on Control and Treated *Soybean* crop (2017)

Sr. No.	Parameter	Treatments		Difference
		Control	Treated	
1	DM	18.10	19.30	1.2%
2	CP	28.30	27.60	0.7%
3	Cfat	3.20	4.50	1.3%
4	CF	28.10	29.70	1.6%
5	Total Ash	15.90	16.20	0.3%
6	AIA	6.90	7.30	0.4%
7	NFE	22.50	22.00	0.50%
8	TC	50.60	51.70	1.1%

During the second year i.e.2017 the contents of dry matter, crude protein, crude fat, crude fibre, total ash, acid insoluble ash, nitrogen free extract, total carbohydrate from treated crops were 19.30, 27.60, 4.50, 29.70, 16.20, 7.30, 22.00 and 51.70 respectively whereas from the control that were 18.10, 28.30, 5.20, 28.10, 15.90, 6.90, 22.50 and 50.60 respectively. In the last year (2018) the dry matter, crude protein, crude fat, crude fibre, total ash, acid insoluble ash, nitrogen free extract and total carbohydrate from treated *soybean* were 22.50, 29.30, 6.40, 30.90, 15.40, 7.20, 18.00 and 30.90 respectively. On the other hand from control *soybean* were 20.60, 27.80, 5.80, 28.70, 14.70, 5.80, 23.00 and 51.70 respectively.

The results obtained by Rajput *et al.*, (2018) on proximate composition from legume and non-legume fodder crops were however higher than the results obtained during present work. The results recorded from present work for the yields are in agreement with the results obtained by Patil and Mungikar (1991). The variations seen in the values of control crops were due to the seasonal changes. The results obtained indicated that the dry matter yield and nutrient elements showed an increase owing to utilization of poultry manure, chicken manure, compost manure

Graph:



IV. CONCLUSION

The response of soybean crop to various treatments was evaluated with growth attributes and yield attributes nutrient contents of soil before sowing and after harvest. The salient findings of this investigation are enumerated as under. The Biochemical composition of soybean concluded for three years, the dry matter yield of soybean crop was comparatively high (22.50%) in 2018 as compared to the dry matter production in the years 2016, 2017 which was (17.30%) (19.30%) respectively. 13. The crude protein was recorded maximum in the year 2018 i.e. (29.30%) whereas it was (27.60%) and (31.85%) during the 2017 and 2016 respectively in soybean crop. 14. Total carbohydrates was recorded maximum in the year 2017 i.e. (51.70%) whereas it was (30.90%) (49.05%) during the 2018 and 2016 respectively. 15. From the present work it may be concluded that the legume and non-legume fodder plants with more nutritive significance and increased productivity can be practiced in this Marathwada region.

V. ACKNOWLEDGEMENT

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Ethnobotanical Report on Some Wild Edible Fruits of Beed District of Maharashtra

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ABSTRACT

Wild edible fruits consumed as food and medicine by tribes Dhangar, Phase Pardhi, Mahadeo Koli, Bhil, and local inhabitants in Beed district of Marathwada region. The study area is fragmented in small hilly and plateau forest patches of highly diversified flora. Under field investigations, about 48 wild edible fruit plant species belongs to 41 genera of 27 families were reported. About 39 edible fruits plants species are utilized as raw, 14 for vegetable purpose, 10 for medicinal use, and remaining 07 used for the preparation pickles or jams. The wild fruits are edible and enriched with high nutritional value. The purpose of this investigation is identification, documentation and recommendation of wild edible fruits used by tribes and local peoples, also needs to conserve the edible fruit yielding plant species and traditional knowledge from its decline recently.

Keywords: Ethnobotany; Wild edible fruits; Nutraceuticals; Traditional knowledge; Beed district

I. INTRODUCTION

The present research work aims at making an in-depth exploration and critical appreciation of the wild edible fruit plants. Term ethnobotany states that the use of natural resources and products in humans domestic life. Utilization of the natural resources is based on very ancient religious knowledge from Vedic periods (Deb, 2013). Rising human population affects the natural resources due to their daily need. The forest exploits numerous resources in their metabolic life cycle. The study area is varied in climatic, edaphic, and environmental factors which affect the plants distribution at varied geographic regions. The wild edible fruits are most important basic need as a food of tribes and local residents in food scarcity and daily needs. The wild edible fruits are the current need to recommend as the cultivated fruit thereby it can serves as food material for ever rising population (Valvi, 2011). They are rich source containing high minerals, fibers, vitamins, proteins, and carbohydrates which are necessary to fulfill the demand of our body (Khaple, 2012). As they are highly edible having nutritional properties contains minerals and ions such as calcium, sodium, magnesium, iron, phosphorous and potassium. The documentation of wild edible fruits plays significant role to enhance the natural food resources and its utilization with the help of religious traditional knowledge (Nandini, 2014). The

local inhabitants acquired the knowledge about wild edible plant species based on trials in the fields and knowledge of wild edible fruit plants can be used to solve food insecurity and malnutrition problems (Sivakumar, 2005; Oak, 2015). Utilization of wild edible fruits has progressively decreased due to the introduction of new cultivated fruit crop plants.

The wild edible fruits not only the food but also contributes the beneficial nutrition source to ever increasing population throughout the year and in food scarcity (Sasi, 2012). The wild edible fruits play an important role in sustainable lives of tribal communities and local inhabitants residing in forest areas (Deshpande, 2015). Rising food demand can be overcome through use of these wild edible fruits could be a solution on problem of malnutrition or nutrient deficiency in human being (Oak, 2015). The wild edible fruit resource contributes as a substitute for cultivated edible fruits. In India, about 54 million native people of different ethnic groups inhabiting various provinces and possess their own distinct traditions, food habit and a rich traditional knowledge (Shaikh et al., 2014).

II. OBJECTIVE OF THE STUDY

The main objective of the investigation is to explore wild edible fruit bearing plants used by tribes and their utilization as nutrient rich wild edible food for the better human health.

III. STUDY AREA

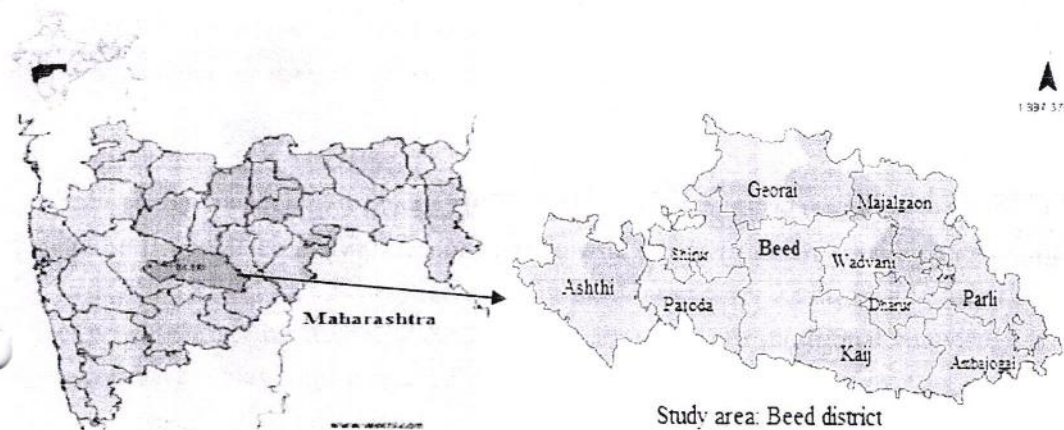


Fig 1. Study area

Beed district is a central region of Maharashtra state in India. Area falls into two parts are plain area in North is bank of Ganga-Godavari while elevated parts of the Deccan black basalt stone ranges of Balaghats (Jaju et al. 2014; Choudhari 2019). The present investigation of this study was carried out in the study area like Dharur Tahsil, Kapildhar, Godavari, Bindusara, Manjra, Sindhphana river belts, and Majalgaon dam surrounding area in Marathwada region, Maharashtra state of India (Fig. 1). The villages where the survey was done at Waghora, Talkhed, Rajegaon, Kalegaon, Gavhan, Ridhori, Dubbathadi, Hivra (B.), Rampuri, Javla, Sadola, Tadsonna, Mothewadi, Manjrath, Rakhachiwadi, Tigaon, Shimpe Takli, Golegaon, Ghalatwadi, Laul, Sautada, Vida,

Umapur, Chausala, and Sirsala etc. The study area lies between ranges from N18°98.021' to N19°28.006' latitude while E070°76.645' to E075°73.513' longitude and an altitude of plains 1200 to 1500 and elevated areas 2000 to 2200 feet above mean sea level was recorded (Salave and Reddy 2012; Mandale et al. 2019). The average annual rainfall is around 66.6 cm (Mandale et al. 2019). Total area of Beed district is 10615.3 Sq. Kms. The soil profile varied in textures as black cotton soil, red soil and some part occupy arid soil (Dhamak et al. 2014). The vegetation is classified as dry deciduous forests, in the plains or high altitudes (Mandale et al. 2019; Jeph and Khan 2019). The study area is highly diversified and also comprising rare, endemic, endangered, and threatened (RET) category species.

IV. METHODOLOGY

The present study was carried out by organizing several field tours and procures the information regarding wild edible fruits from tribal communities and local inhabitants. Field tours were arranged at each time, different season chosen to procure the plant information, identification, and collection of voucher specimens. Almost all investigated plant species were found to occur at ground vegetation and high elevation. The collection of wild edible fruits from several localities where daily consumed by tribes and local residents in their food or medicine. Plant material were collected in their flowering and fruiting period and identified by referring Flora of Maharashtra State (Singh *et al.* 2001) and by using various databases. Herbarium specimens were prepared, mounted, and deposited to Department of Botany, Sunderrao Solanke Mahavidyalaya, Majalgaon 431131, Beed, (M.S.), Maharashtra. The present study was carried out in the duration of February 2020 to March 2022. The wild edible fruit trials were investigated from tribes and local residents. Edible fruits are consumed by tribes and local residents as ripe, raw, vegetables and pickles.

4.1. Tribes and local inhabitants

The tribes belief on ancient religious knowledge and use of natural resources in their daily needs. They entirely depend on the available natural resources. The wild edible fruits are used by tribals and local peoples in their day to day life. Tribes and local citizens where resident at several villages and forest patches in the study area. Tribes provided the information about folk medicine as per our traditional knowledge which play essential role in the conservation of natural resources.

4.2. Statistical analysis

The investigated data was statistically analyzed using MS Excel program for calculating ethnobotanical utilization of plants in graphical representation (Fig. 2).

V. RESULTS AND DISCUSSION

Results revealed that, the use of traditional knowledge of wild edible fruits by *Dhangars*, *Phase Pardhi* and local people in their daily food. The total number of 48 wild edible fruit plants species belongs 41 genera and 27

families have been recorded during investigation. Under investigation 4 plants each from Papilionaceae, Cucurbitaceae and Solanaceae, 3 from Boraginaceae, Euphorbiaceae, Mimosaceae and Moraceae, 2 from Annonaceae, Anacardiaceae, Caesalpiniaceae, Combretaceae, Rutaceae, Sterculiaceae and Tiliaceae, and remaining each species belongs to rest of families (Table 1).

Majority of the ripe fruits are eaten as raw. Pulp or fleshy pericarp and mesocarp of the ripe berries or drupes of *Balanites aegyptiaca*, *Ziziphus jujuba*, *Madhuca indica*, *Mangifera indica*, *Limonia acidissima*, *Capparis zeylanica*, *Cordia gharaf*, *Cordia dichotoma*, *Phoenix sylvestre*, *Tamarindus indica*, *Azadirachta indica*, *Annona reticulata*, *Annona squamosa*, *Aegle marmelos*, *Securinega leucopyrus*, and *Syzigium cumini* are usually consumed. The unripe fruits used as vegetable and pickles are of *Canvalia gladiata*, *Cordia dichotoma*, *Cordia gharaf*, *Cucurbita maxima*, *Ficus racemosa*, *Limonia acidissima*, *Luffa acutangula*, *Solanum torvum*, *Tribulus terrestris*, *Trichosanthes dioica* etc. (Table 1). Traditional knowledge on wild edible fruits is now frequently restricted to aged persons, as the new generations have modified to intense and refining the new high yielding varieties. Wild fruits are not only rich in nutrients but also have certain curative properties against various diseases. Recent times, traditions of several tribal communities are gradually decline, so there is urgent need to investigate the traditional knowledge for mankind (Rasingam, 2012; Kamatchi and Parvathi, 2020).

The purpose of this study is documentation, identification, and recommendation of wild edible fruits used by tribes and local inhabitants in the study area. Wild edible fruits are easily accessible and cost effective natural resources to enhance the dietary habit and nutritional values for the healthy growth and indirectly curing related diseases and disorders.

Table 1 Study of wild edible fruits, and their mode of administration

Wild edible plants	Family	Common Name	Flowering and Fruiting	Mode of administration (utilization)
<i>Acacia nilotica</i> (L.) Willd. ex. Del	Mimosaceae	Babhul	Sept-Feb	Mature ripe legumes are used to treat toothache and also eaten as raw.
<i>Aegle marmelos</i> (L.) Corr.	Rutaceae	Bel	Apr- Sept	Aromatic pulp of fruits is eaten with sugar for stomach disorder.
<i>Annona reticulata</i> L.	Annonaceae	Ramphal	Feb-April	Ripe fruits are eaten as a raw.
<i>Annona squamosa</i> L.	Annonaceae	Sitaphal	May-Aug	Ripe fruits eaten as a raw.
<i>Argyreia nervosa</i> (L.f.) Sweet.	Convolvulaceae	Samudrashok	Sept-Mar	Pulp of ripe fruits is eaten as a raw.
<i>Artocarpus heterophyllus</i> Lam.	Moraceae	Phanas	Jan-May	Ripe fruits eaten as a raw and also used as pickles, jams and chips.
<i>Azadirachta indica</i> A. Juss	Meliaceae	Kadu-nimb	Feb-June	Fully ripe fruits are edible.

<i>Balanites aegyptiaca</i> (L.) Del.	Balanitaceae	Hingan	Nov-Apr	Ripe fruits pulp eaten as raw and also used to treat the stomach problems, fever, and jaundice.
<i>Bauhinia racemosa</i> Lam.	Caesalpinaceae	Kanchan	Mar-Aug	Young legumes are used as a vegetable.
<i>Cajanus lineatus</i> (Wight & Arn.)	Papilionaceae	Ran-Tur	Aug-Jan	Mature legumes are eaten as a raw.
<i>Canvalia gladiata</i> (Jacq.) DC.	Papilionaceae	Patad sheng	Oct-Mar	Young legumes are used as a vegetable.
<i>Capparis zeylanica</i> L.	Capparidaceae	Waghati	Dec-May	Mature unripe fruits are used as vegetable and ripe pulpy berries are eaten as a raw.
<i>Cassia fistula</i> L.	Caesalpinaceae	Bahava	Mar-Oct	Juvenile fruits (Legumes) are used as vegetable and pulp of mature fruits is eaten as a raw.
<i>Cordia dichotoma</i> L.	Boraginaceae	Bhokar	Mar - Aug	Mature fruits are used as pickle and ripe fruits are eaten as a raw.
<i>Cordia gharaf</i> Ehrenb. ex Asch.	Boraginaceae	Chhota Bhokar	July-Oct	Ripe fruits are eaten as a raw.
<i>Cucurbita maxima</i> Duch.	Cucurbitaceae	Kashiphal	June-Sept	Mature fruits are eaten as vegetable, fruit is very holistic.
<i>Diospyros peregrina</i> Roxb.	Ebenaceae	Tendu	Mar-May	Ripe fruits are eaten as a raw.
<i>Ehretia laevis</i> Roxb.	Boraginaceae	Ajaanvruksha, Datrang	Mar-July	Ripe fruits are eaten as a raw.
<i>Emblica officinalis</i> Gaertn.	Euphorbiaceae	Avla	Sept-Mar	Mature fruits are eaten as a raw and also used as Pickles and Murabba.
<i>Ficus hispida</i> L.f.	Moraceae	Genda Umbar	Jan-July	Unripe fruits are used in curries.
<i>Ficus racemosa</i> L.	Moraceae	Umbar	Jan-June	Mature unripe fruits are used as vegetable and ripe fruits are eaten as a raw.
<i>Grewia hirsuta</i> Vahl	Tiliaceae	Makadmeva	Sep-Jan	Ripe fruits are eaten as a raw.
<i>Grewia tiliifolia</i> Vahl	Tiliaceae	Dhaman	May-Aug	Ripe fruits are eaten as a raw.
<i>Helicteres isora</i> L.	Sterculiaceae	Murud sheng	Dec-May	Pulp of mature fruits are used in childs.

<i>Leucaena leucocephala</i> L.	Mimosaceae	Subabhul, Shevri	Nov-Apr	Legumes are used as a vegetable.
<i>Limonia acidissima</i> L.	Rutaceae	Kavath	Mar-Sep	Pulp of ripe and unripe fruit eaten as raw or vegetable, also eaten with sugar or salt.
<i>Luffa acutangula</i> (L.) Roxb.	Cucurbitaceae	Jangli Dodka	Aug-Dec	Fruits are used as vegetable and also used in Pakoda.
<i>Madhuca indica</i> Gmel. Syst.	Sapotaceae	Moha	Nov-Mar	Ripe fruits are eaten as a raw and on cook.
<i>Mangifera indica</i> L.	Anacardiaceae	Amba	Jan - July	Fruits are eaten as a raw or by preparing Juice, Jams and Pickles.
<i>Mukia maderaspatana</i> (L.) Roem	Cucurbitaceae	Kamuni	Sep-Dec	Mature unripe fruits are eaten as a raw.
<i>Opuntia elatior</i> Mill.	Cactaceae	Nivdung	Jan-Dec	Ripe fruits are eaten as a raw.
<i>Passiflora foetida</i> L.	Passifloraceae	Krishna Kamal	July-Dec	Ripe berries are eaten as a raw.
<i>Phoenix sylvestre</i> (L.) Roxb.	Arecaceae	Sindhi	Feb- May	Ripe fruits are eaten as a raw also used as jams and jellies.
<i>Physalis minima</i> L.	Solanaceae	Ran Popati	Oct-Mar	Fruits are eaten as a vegetable.
<i>Pithecellobium dulce</i> (Roxb.) Benth.	Mimosaceae	Vilayti Chinch	Jan-June	Mature or ripe fruits are eaten as a raw.
<i>Securinega leucopyrus</i> (Willd.) Mull. Arg.	Euphorbiaceae	Pulan	Feb-Sept	Ripe fruits are eaten as a raw.
<i>Semecarpus anacardium</i> L.f.	Anacardiaceae	Bibba	Nov-Apr	Ripe or dry fruits are eaten as raw and also used as oil source and holistic.
<i>Solanum anguivi</i> Lam.	Solanaceae	Mothi Ringni	Aug-Dec	Ripe fruits are eaten as raw and also unripe fruits are eaten as a vegetable.
<i>Solanum nigrum</i> L.	Solanaceae	Kanguni	Aug-Jan	Ripe fruits are eaten as a raw.
<i>Solanum torvum</i> Sw.	Solanaceae	Marang	Jan-Apr	Fruits are eaten as raw or on cooked.
<i>Syzigium cumini</i> (L.) Skeels	Myrtaceae	Jambhul	April-July	Ripe fruits are eaten as a raw.
<i>Tamarindus indica</i> L.	Papilionaceae	Chinch	Nov-May	Ripe and unripe fruits are eaten as a raw.

<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Combretaceae	Behda	Feb-June	Mature fruits are used to making churna.
<i>Terminalia chebula</i> Retz.	Combretaceae	Hirida	Feb-May	Used as making pickles and jams, churna.
<i>Tribulus terrestris</i> L.	Zygophyllaceae	Sarrata	Aug-Oct	Juvenile and mature fruits are eaten as raw or as a vegetable.
<i>Trichosanthes dioica</i> Roxb.	Cucurbitaceae	Padval	Aug-Sep	Fruits are eaten as raw and as vegetable on cooked.
<i>Vigna spp.</i>	Papilionaceae	Mugi	Aug-Oct	Juvenile and mature legumes are eaten as a raw or vegetable.
<i>Ziziphus jujuba</i> (L.) Gaertn.	Rhamnaceae	Bor	Oct-Jan	Ripe fruits are eaten as a raw.

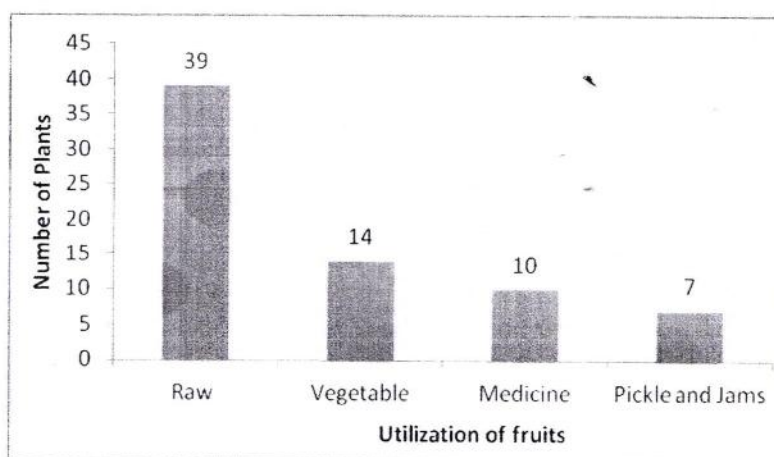


Fig. 2 Ethnobotanical utilization of wild edible fruits

VI. CONCLUSION

The use of wild edible fruits provides seasonal foods and alternative to the agriculturally cultivated crops. Wild edible fruits are not only for food and nutrition, but it could be an income source when on sustenance and recommend commercially. The administration of wild edible fruits by tribes and local inhabitants in their daily food or medicine, but there is need to further study to analyze the quantity and quality of nutrition status and how the edible fruits used to maintain supplement of our body and in the recovery of some nutrient deficiency-caused diseases. Therefore, there is need to create awareness in the local inhabitants about the plants conservation for future prospects.

Acknowledgement

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FOREST RESOURCES, BIOTIC INTERFERENCE AND SUGGESTION FOR CONSERVATION OF YAWAL - PAL WILD LIFE SANCTUARY AND ITS ENVIRONS, FROM SOUTHERN SATPUDA RANGES (M.S.)

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Abstract:

The present work has been carried out during June 1991 to December 1995. Besides the survey has been done during 2017 to 2019. During this investigation an emphasis was given on the documentation of different forest resources such as, timber species used by tribals and villagers, oil, tannin, Dyes, Gum, Resin, kath, liquor yielding plants, lach, edible fruits and seed yielding plant species. Biotic interference and suggestion for conservation of Yawal - Pal wild life sanctuary and its environs is given in detail.

Keywords: Tribals, forest resources, survey, Yawal-Pal wild life Sanctuary, Biotic interference, conservation.

Introduction:

There are seven ranges of satpuda which run more or less parallel to each other. According to Karnik (1959), satpuda starts from Mahadev hills of Chauragarh in Madhya Pradesh, extending westward to Burhanpur and Nimar, thence to Khandesh. Mountain tracts of satpuda are situated between Vindhya ranges and Chandor hills of the Sahyadris from the Western Ghats.

Southern satpuda is divided into three talukas namely, Chopda, Yawal and Raver. The Yawal - Pal wildlife sanctuary is situated in these three talukas. This area lies between 75° 41' and 76° 9.73' E longitudes and 21° 3.42' and 21° 25' N latitudes. This area is about 120 km in length having a width of 45 km. The average height of this area is 721 meters and it varies between 700-1150 meters. The headquarter of sanctuary is at Yawal. It covers an area of 177 sq. kms. Height of the sanctuary varies between 700 m. to 1134 m. Highest hillock is situated near the Gawilgad hills, in Yawal taluka (1134 m.) The rainfall of sanctuary varies between 800-900 mm. The average maximum and minimum temperature is 43°C and 8°C respectively.

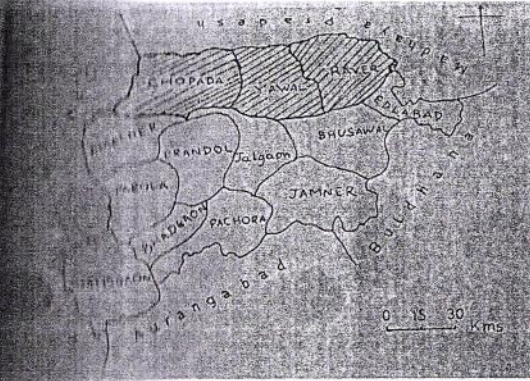


Figure 1: Map of Jalgaon District

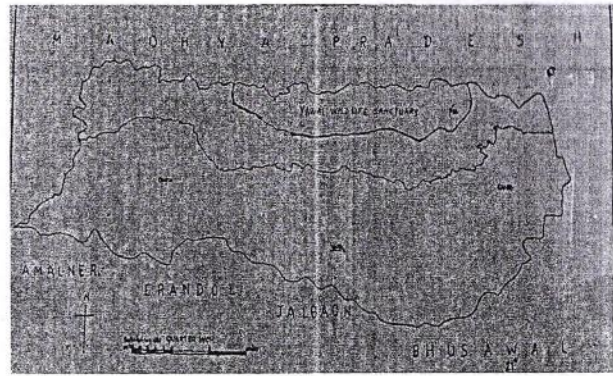


Figure 2: Map of Yawal W.L.S.

Material and Methods:

The botanical excursions were arranged, to cover all the places of botanical interest and excursions were made regularly, one a month and during the survey forest resources, Biotic resources were find out and notes were taken in the filed dairy. Data are collected after discussion with tribals, villagers and officers of Yawal – Pal forest department. Specimen were brought to the laboratory and identified with the help of Floras such as Cooke (1958), Hooker (1897) and Santapau (1967).

Result and Discussion:

Following timber species are used by tribals and villagers for hut, house construction and Agriculture equipments. The major timber species are found in Southern satpuda ranges such as, *Anogeissus latifolia*, *Acacia farnesiana*, *Acacia chundra*, *Bridelia retusa*, *Careya arborea*, *Chloroxylon swietenia*, *Dalbergia latifolia*, *Dalbergia paniculata*, *Grewia tiliaefolia*, *Hardwickia binata*, *Lagerstroemia parviflora*, *Melia azadiracta*, *Ougeinia parviflora*, *Pterocarpus marsupium*, *Soymida febrifuga*, *Syzygium cumini*, *Schleichera oleasa*, *Terminalia grandis*, *Terminalia crenulata*, *Mangifera indica* and *Mitragyna parvifolia*.

Cymbopogon martinii (Rosha grass) yields the commercially important Rosha oil. Rosha oil obtained from seeds of *Pongamia pinnata*. The Rosha oil gives revenue about 50,000 rupees per annum. Important tannin yielding species are *Bridelia retusa*, *Cassia grandis*, *Garuga pinnata*, *Lagerstroemia paeviflora*, *Lannea coromandelica*, *Soymida febrifuga*, *Terminalia crenulata*, *Terminalia bellirica* and *Ziziphus mauritiana*.

Dyes are obtained from the bark or wood of *Acacia leucophloea*, *Hardwickia binata*, *Terminalia tinctoria*, *Terminalia crenulata* and Dyes obtained from flower, bark and young leaves

of *Butea monosperma*. Gum is obtained from *Acacia nilotica*, *Anogeissus latifolia*, *Melaleuca azadiracta* and *Sterculia urens* (Kad dink). Forest department earns a revenue of Rs. 12,00,000 from gum of *Anogeissus latifolia* and Rs 21,00,000 from gum of *Sterculia urens*.

Resin is obtained from *Commiphora mukul* and *Boswellia serrata*. Flower of *Madhuca longifolia* are used as cheap material in liquor distillation. Kath is obtained from the heart wood of *Acacia chundra*. Rhizomes of *Pachystoma senile* (safed misery) are collected for medicinal purposes. Forest department earns revenue Rs, 2,00,000. *Bauhinia racemosa* and *Diospyros melanoxylon* (Temburni) leaves are used for manufacturing bidis. Lakh is collected from forest. Forest department earns revenue Rs.10,000.

Edible fruits are found from the trees such as , *Cordia dichotoma* , *Carissa congesta*, *Emblica officinalis*, *Ficus racemosa*, *Gmelina arborea*, *Limonia acidissima* , *Mangifera indica*, *Rhus mysurensis*, *Syzygium cumini*, *Tamarindus indica*, *Terminalia bellirica*, *Ziziphus glaberima*, *Ziziphus mauritiana*, and *Ziziphus rugosa*.

Seeds of *Buchanania lanzan* and *Buchanania axillaris*, are Commercially very important. In addition to this seeds of *Holoptelia integrifolia*, *Schleichera oleosa* and *Strychnos potatorum* are also edible.

Leaves of *Cassia tora*, *Daemia extelsa* are used as vegetable. Leaves of *Abrus precatorius* are commercially important. They are used in Indian Pan masala.

Biotic interference:

There is awareness, regarding preservation of environment in the society. Many species are being lost due to biotic interference. So, it is important to study the flora and fauna of reserved forest. Many Botanists studied the biotic interference of reserve forest from different part of India such as Bhat Mohd Skinder and Ashok K. Pandit (2012), and Lone, H.A. and Pandit (2005). The present survey was undertaken with a view to find out a Biotic Interference in study site.

Vegetation of Southern satpuda is disturbed due to biotic interferences overgrazing by people and animals have adversely affected the ground vegetation. Due to overgrazing the soil erosion takes place. Tribes set fire for minor forest products and also for hunting, which affect the vegetation. Tribes depend upon the forest for edible fruits, honey, wax, gum, resin, timber and other minor forest products forest wood is also required for fuel. While collecting honey and wax sometimes the whole tree may get damage.

Demand of timber increases for the construction of huts and houses. Paper factory needs wood and other trees. Forest is also cut for electrification. In general interference of human activities affects the vegetation.

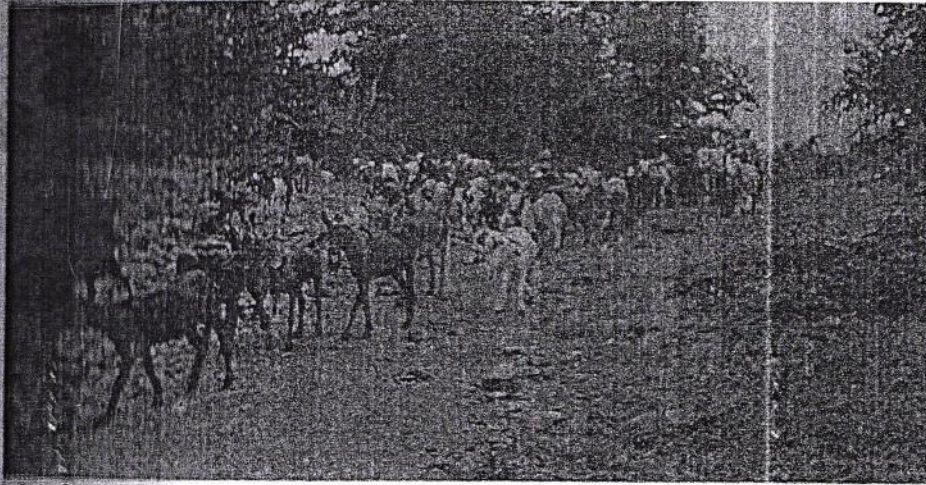


Figure 3: Grazing by cattle has adversely affected the regeneration of plant species



Figure 4: Deforestation by tribals staying in the Southern satpuda ranges

Preparation for conservation of Yawal – Pal wild life sanctuary and its environs, from Southern satpuda ranges:

Measures should be adopted to prevent the massive deforestation prevailing in the area. In this connection, it is necessary to increase the security arrangements in the forest. Number of forest guards be increased, so that they can keep close watch on the forest. It is interesting to

note that forest guards are unarmed. They should be provided with sufficient arms. So they can protect themselves as well as valuable forest.

2. The process of afforestation should be accelerated by establishing or improving forest nurseries in the area. Before selecting the tree species in the nurseries; following points should be considered.

- i. The plant species should be adaptable in the locality.
- ii. Plant species should be of multipurpose use. In the process of afforestation local participation, involvement of native tribes should be insured. It will give them some economic support.

3. Measures should be taken for the conservation of soil and water. These includes:-

- i. To protect the vegetation from over grazing.
- ii. Barren land should be planted by the species which will bind the soil. Grasses species such as *Andropogon pumilus*, *Cymbopogon martinii*, *Heteropogon contorts*, *Sorghum halepense* and *Themeda quadrivalvis* can be recommended.
- iii. Wind barriers such as shelter belts, hedges minimize the wind velocity. Tall tree species such as *Albizia procera*, *Azadirachta indica*, *Alstonia scholaris*, *Ficus bengalensis*, *Ficus amplissima*, *Ficus religiosa*, *Mangifera indica*, *Casuarina equisetifolia* and *Millingtonia hortensis* can be planted.
- iv. Construction of contour bunds which act as a barriers against water flow, will facilitate infiltration of the water in soil. This is also prevents the soil erosion.
- v. On the steep slopes graded bench terracing should be done.

4. Local people be trained and incentive be given to them for the protection of forest.

5. To protect fauna, strict measures regarding safety be taken. For the wild life, shelter and water facility be made available.

Conclusion:

Intention behind the selection of this study site is that sixty percent of total forest of Jalgaon district belongs of this area. Total forest in this area has been declared as a reserved forest. A variety of climatic, different rivers are flooded in the area and altitudinal variations coupled with varied ecological habitats have contributed immensely to the rich vegetation wealth and varied flora and fauna generating thus a very rich biodiversity observed in Southern satpuda ranges. The forest of Southern satpuda ranges has great potential from the economic as well as botanical point of view. The depletion of forest wealth is mainly due to uncontrolled biotic interference. So, it is urgent need to conserve the forest.

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On

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Convener

Dr. V.P.Pawar
Principal

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Fax. 02443-234037

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It gives us great pleasure to extend our cordial invitation to you on behalf of our college to participate in the National Conference on "Population growth : Environmental degradation problems and prospects" organized by Department of Botany and Zoology dated on 27th September 2016. We welcome you and your colleges to participate in the Conference with yours papers for oral/ poster presentation.

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About Majalgaon

Majalgaon is a fine Tehsil location situated on the bank of the river, Sindphana. It can boost itself of having been a special asset to the district of Beed. Majalgaon is well known for its commercial significance. Connected with other cities by the National Highway No.222. Majalgaon is a cynosure for its having the enriched Dam. In addition, Manjarath is a shrine, aka Dakshin Kashi that neighbours the city of Majalgaon. Purushottampuri is another neighbouring pilgrimage that is known as Dham (a sacred place) as well. The famous Jyotirlinga of Parali (V) is just 70 km away form Majalgaon. Suffice to say, Majalgaon is a place worth visiting.

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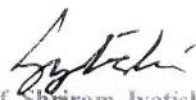
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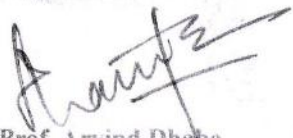
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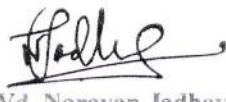
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