

DEPARTMENT OF FOREST BIOLOGY AND TREE IMPROVEMENT

The department of Forest Biology & Tree Improvement came into existence from June 2010 after recruitment of staff as per the recommendations from ICFRE & ICAR. The main objectives of the department are to impart education regarding forest genetic resources, forest biotechnology at UG and PG levels and to carry out priority based innovative research on tree improvement, plant tissue culture and forest biotechnology. M.Sc. (Forestry) with specialization in Forest Genetic Resources and Forest Biotechnology commenced from the year of 2010. The department is equipped with well established laboratory of Tree improvement, Plant Tissue Culture and Molecular biology. Beside, education this department is committed to extend new technology and improved propagation material to the farmers through research.

Objectives:

- 1) Under and post graduate Teaching
- 2) Basic and applied Research in Tree Improvement, Forest Genetics, Forest Biotechnology, Forest Genetic resources, Biodiversity conservation etc.
- 3) Extension activities

TEACHING

Courses at UG level offered by department

Course No.	Course Title	Credit
FBT-2.1	Forest Ecology, Biodiversity and Conservation	2+1
FBT 3.2	Principles Tree Improvement	2+1
FBT 3.3	Tree Seed Technology	1+1
FBT 4.12	Dendrology	2+1
FBT 4.2	Fundamentals of Wildlife	2+0
FBT 4.3	Forest Pathology	2+1
FBT 5.1	Wildlife Management	2+1
FBT 6.1	Forest Entomology and Nematology	1+1
FWE 7.1	Experiential learning on Medicinal & Forest plant Nursery	0+2 0+2

Courses at PG level offered by department

Course No.	Course Title	Credit
FOR 505	Forest Ecology and Biodiversity Conservation	2+1
FOR 509	Tree Improvement	1+1
FGR521	Breeding Methods in Forest Trees	2+1
FGR 522	Reproductive Biology of Forest Tree	2+1
FGR 523	Tree Seed Orchard	2+1
FGR 524	Quantitative Genetics in Tree Breeding	3+0
FGR 525	Forest Genetic Diversity and Conservation	3+0
FB 522	Plant Tissue Culture	2+1
FOR 602	Advances in Tree Improvement	2+1
FGR 621	Advances in Tree Breeding	1+1

FGR 622	Advances in Quantitative Forest Genetics	2+1
FGR 623	Forest Reproductive Biology	2+1
FGR 624	Molecular Genetics of Forest Trees	2+1
FGR 625	Genetics of Forest Ecosystems	2+0
FB 621	Advances in Forest Biotechnology	2+1
FB 621	Molecular Genetics and Gene Mapping in Forest Trees	2+1
FB 621	Molecular Biochemistry	2+1
FB 621	Tree Physiology and Forest Productivity	2+1
FB 621	Genetic Engineering and Bioinformatics	2+1

Department involved in teaching UG Courses offered by Other Departments

Course No.	Course Title	Credit
BSH.4.12	Tree Physiology	2+1
SAF 2.3	Nursery Management	1+1

Department involved in teaching PG Courses offered by Other Departments

Course No.	Course Title	Credit
PSMA 505	Breeding of Medicinal and Aromatic Crops	2+1
MAP 524	Improvement of Medicinal and Aromatic Plants	1+1
MAP 521	Basics of Plant Production & Breeding Techniques	2+1
MAP 523	Biotechnological Approaches & Agro-techniques for MAP species	2+1 (Associated course)

(A) Passed out PG Masters Students of FGR and their Thesis Title

Sr. No.	Student's Name	Major Guide	Thesis Title	Specialization	Year of submission
1	Raju S. Rajpoot (04-0896-2010)	Dr. M. U. Kukadia	Morphological variation and carbon sequestration potential of various clones of <i>Eucalyptus</i>	Forest Genetic Resources	2012
2	Sumit K. Gupta (04-0901-2010)	Dr. S.K. Jha	Morphological and certain wood characteristics variation in <i>Eucalyptus</i> clones	Forest Genetic Resources	2012
3	Koyande Suyog (04-0891-2010)	Dr. S.K. Jha	Evaluation of Phytoremediation potential in <i>Jatropha Curcas</i>	Forest Genetic Resources	2012
4.	Durga S. Nagar 04-1049-2011	Dr. S.K. Jha	<i>In vitro</i> regeneration of <i>Millettia pinnata</i> (L.) Panigrahi	Forest Biotechnology	2013
5.	Jani Jigar (04-1313-2012)	Dr. S.K. Jha	<i>In vitro</i> regeneration of <i>Psoralea corylifolia</i> and <i>Tinospora cordifolia</i> - Anticancerous and Antileprotic plants	Forest Biotechnology	2014

RESEARCH

<u>Completed Projects:</u> (External aided)	<ol style="list-style-type: none"> 1. Germplasm collection, evaluation, characterization and selection of harsh site tolerant clones of <i>Karanja</i>. (Funded by NOVOD Board). PI- Dr. S.K. Jha 2. Socioeconomic survey and ethno-botany of forest dwellers in the Dangas. (Funded by Gujarat Forest Department). PI- Dr. S.K. Jha
--	--

3. Forest resource survey of Valsad Forest Division. (Funded by Gujarat Forest Department). PI- Dr. S.K. Jha
4. National Network of integrated development of Jatropha. (Funded by NOVOD Board). PI- Dr. S.K. Jha
5. Identification, Isolation and molecular characterization of RCPGS in Castor. Co-PI- Dr. S.K. Jha
6. Promotion of scientific management of Palmyra palm (RKVY).
7. Co-PI- Dr. S.K. Jha

On Going Projects:

- Departmental projects:**
1. *In vitro* regeneration of *Acacia mangium* Willd. via direct and indirect organogenesis. (PI- Mr. R.S. Chauhan)
 2. *In vitro* propagation of *Santalum album*. (PI- Dr. S.K. Jha)
 3. Evaluation of *Melia composita* families for germination traits and growth variation at nursery stage. (PI- Mr. R.S. Chauhan)
 4. Mass propagation of *Acacia mangium* through axillary bud. (PI- Mr. R.S. Chauhan)
 5. *In vitro* propagation of *Melia composite*. (PI- Dr. S.K. Jha)
 6. Standardization of Mass Vegetative Propagation Techniques for Selected Eucalyptus Clones. (PI- Mr. S.A. Huse)
 7. Evaluation of Eucalyptus Clones for growth and physiological characters. (PI- Mr. S.A. Huse)
 8. Evaluation of Eucalyptus Clones for growth and biomass. (PI- Mr. S.A. Huse)
 9. Standardization of Mass Propagation protocol for *Tactona grandis* Linn.F. (PI- Mr. R.S. Chauhan)
 10. *In vitro* regeneration of *Nathapodytes foetida* – an endangered medicinal plant. (PI- Dr. S.K. Jha)
 11. Screening of some fast growing tree species for phyto remediation of cadmium polluted sites. (PI- Dr. S.K. Jha)
 12. Development of mass propagation protocol for Safed Musli. (PI- Dr. S.K. Jha)

RECOMMENDATIONS/ CONCLUDED EXPERIMENT

1. Collection and evaluation of Mucuna germplasm from South Gujarat for L-DOPA and protein content – Dr. N.S. Thakur *et al*

Recommendation-For higher L-DOPA (L-3, 4-dihydroxyphenylalanine) it is advisable to collect Mucuna from Valsad, Chikhali, Budhakeshwar village (Navsari Mahuva road), Bardoli and Vyara. Breeders willing to enhance L-DOPA content in *Mucuna pruriens* may incorporate accessions namely 29, 10, 14 and 13 in breeding stock. [Agresco-2015]

2. Rapid multiplication of *Dendrocalamus strictus* Nees. through *in vitro* regeneration techniques from juvenile explants- Mr. Jayesh Pathak et al

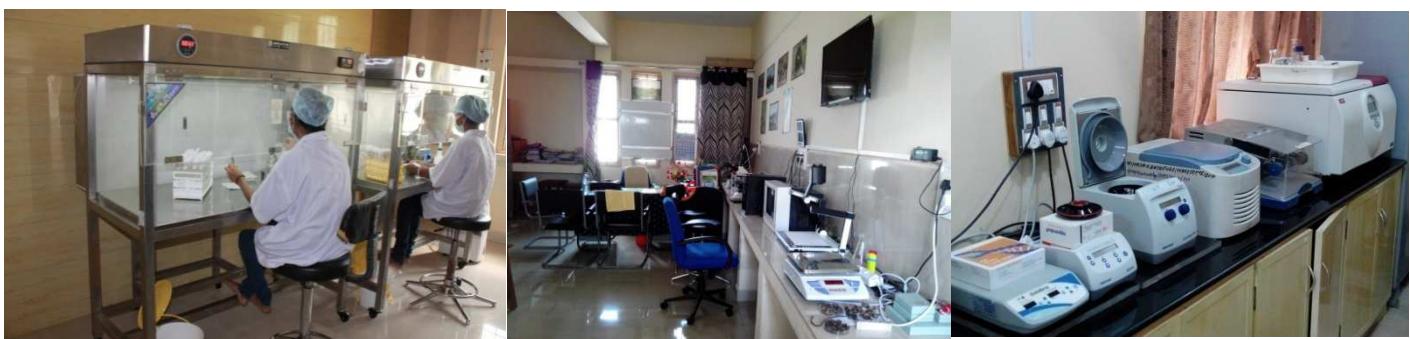
Recommendation- It is recommended to scientific community and tissue culture industries involved bamboo tissue culture that to get rapid multiplication of *Dendrocalamus strictus* L. through in vitro regeneration from juvenile explants using tissue culture technique for large scale multiplication of the plantlets in which farmers can get true to type plants with all the advantages of vegetative propagation (clonal propagation). It is recommended to use auxiliary bud as explants source and absolute alcohol (100%) for 30 Sec + mercuric chloride (0.1%) for 4 min. for contamination control and maximum establishment. Whereas, for culture establishment and for shoot multiplication it is advised to use MS liquid media with 2.0 mg/lit BAP. However, for rooting it is advised to use MS + 1.5mg/l NAA + 3mg/l IBA and for acclimatization it is advised to use FYM+ Soil + Cocopeat (1:1:1). [Agresco-2015]

EXTENSION

1. Advisories to farmers on tree farming and propagation.
2. Participation of staffs in Krishi Mahotsava.
3. Participation in plantation activities at different places during Van Mahotsava.
4. Information to visiting students, farmers about Tree Improvement, Tissue culture and Forest Biotechnology.

INFRASTRUCTURE ESTABLISHED

- Tree Improvement Lab
- Tissue Culture Lab
- Forest Biotechnology Lab
- Tree seed Technology Lab



LIST OF PUBLICATIONS

Full length papers in peer reviewed Journals

1. M. K. Mahatma, V. Khandelwal, **S. K. Jha**, V. Kumar and R. R. Shah. (2009). Genetic diversity analysis of elite parental lines of cotton using RAPD, ISSR and isozyme markers. *Indian Journal of Plant Physiology* **14** (2): 105-110.
2. R. V. Kansara, S. Jha, M. K. Mahatma and **S. K. Jha**. (2010). *In vitro* regeneration of castor plant from apical meristem. *Journal of Oilseed Research* **27**:30-32.
3. Thakur N S, Verma K S, **Jha S K**, Attar S K and Harsha Hegde. (2011). Economics of herbage and oil yield of *Ocimum sanctum* grown under agroforestry systems under rain fed conditions in Western Himalayas. *Indian Perfumer*, **55** (4): 31-39.
4. S. Madhusudanan S., Patil, N.S., **Jha, Suman** and Aneesh. (2011). Short rotation forestry as a viable option for GHG mitigation. *Indian Journal of Ecology* **38** (special issue):15-19.
5. H. Hegde, K. Gopikumar, K. Samom, N. Hegde and **S. K. Jha**. (2011). Calorific value assessment of selected tropical tree species of the Southern India for higher fuelwood potential. *Indian Journal of Ecology* **38** (special issue): 194-195.
6. H. Hegde, S. K. Singh, N. Hegde, N. S. Thakur and **S. K. Jha**. (2011). Peoples participation in forest management. *Indian Forester* **137** (8 (a) special issue):70-75.
7. **S. K. Jha**, H. Hegde and N. S. Thakur. (2011). Community Forestry: A viable option for forest management. *Indian Forester* **137** (8 (a) special issue):100-104.
8. **Huse, S. A.**, Singh, N. B. and Anand, R. K. (2011). Genetic Variability study of photosynthetic traits studied on Willows. *Indian Journal of Agroforestry*. Vol: 13:2:pp.
9. **Huse S. A.**, S.S. Narkhede, J. S. Zope and N. B. Singh. (2011). Effect of spacing and irrigation in *Jatropha curcas* Linn. *Progressive Agriculture*. 11: 2: 364-366pp.
10. Sharma, J. P., N. B. Singh, H. P. Sankhyan, P. Chaudhary and **S. A. Huse**. (2011). Estimation of genetic parameters of newly introduced tree willow clones in Himachal Pradesh, India. *Genetika*. 43:3:487-501pps.
11. **Huse S. A.**, D. B. Jadeja, R. S. Rajpoot and V. Kumar. (2012). Growth performance of twelve eucalyptus clones in South Gujarat. In Anonymous, 2012. Eds. Proceedings of National seminar on Agroforestry. Held at Navsari Agricultural University, Navsari. 304-301pp.
12. Singh, N. B., J. P. Sharma, **S. A. Huse**, I. K. Thakur, R. K. Gupta and H. P. Sankhyan. (2012). Heritability, genetic gain, correlation and principal component analysis in introduced willow (*Salix species*). *Indian Forester*. 138: 12: 1100-1109pp.
13. R. V. Kansara, Sanjay Jha, **Suman Kumar Jha** and M. K. Mahatma. (2013). An efficient protocol for *in vitro* mass propagation of *fusarium* wilt resistant castor (*Ricinus communis* L.) Parental line SKP-84 through apical meristem. *The Bioscan*. **8**(2): 403-408.
14. P. R. Jadhav, M. K. Mahatma, Sanjay Jha, Lalit Mahatma, V. B. Parekh, and **S. K. Jha**. (2013). Change in phenylpropanoid pathway during compatible and incompatible interaction of *Ricinus communis*-*Fusarium oxysporum* f.sp. *ricini*. *Indian J Agric Biochem*, **26**(1): 56-60.
15. V. H. Solanki, V. Khandelwal, D. H. Patel, M. K. Mahatma and **Suman Jha**. (2013). Optimization of gene transfer in cotton via *Agrobacterium tumefaciens*: an assessment of factor influencing the efficacy of gene transfer mechanisms. **27**(1): 1-6.
16. V. S. Srivastav, C. V. Kapadia, M. K. Mahatma, **S. K. Jha**, S. Jha and T. Ahmed. (2013). Genetic diversity analysis of date palm (*Phoenix dactylifera* L.) in the Kutch region of India using RAPD

- and ISSR markers. **25**(11): 907-915 doi: 10.9755/ejfa.v25i11.14325
17. Anand R. K. And **S. A. Huse**. (2013). Genetic divergence studies for fodder quality attributes in open pollinated families of *Bauhinia variegata* Linn. *Global Journal of biosciences and Biotechnology*. 2: 2: 211-214pp.
 18. H.T. Hegde, M.A. Kalkoor, **S.K. Jha** and N.S. Thakur. (2014). Evaluation of variation in physical properties of wood among some tropical tree species of South India. *Indian Forester*, **140** (1): 70-75.
 19. Attar, S.K., K. Kumar and **Jha S.K.** (2014). Diversity analysis in Persian walnut (*Juglans regia* L.) trees of Fhimla Hills. *Indian Forester*, **140** (8): 789-792.
 20. Kumar, V., Kumar, S., **Jha, S. K.**, and Madathil, J. C. (2014). Influence of de-oiled seed cakes on seedling performance of East Indian Rosewood (*Dalbergia latifolia* Roxb.). *Soil and Environment*, **33**(2): 169-174.
 21. Jani J. N., **Jha S.K.**, Nagar D.S., Chauhan R.S. and Hegde, H. (2015). Phloroglucinol plays role in shoot bud induction and *in vitro* tuberization in *Tinospora cordifolia*-a medicinal plant with multi-therapeutic application. *Adv. Tech. Biol. Med.* 3: 125.doi: 10.4172/2379 1764.1000125
 22. Harsha Hegde, Kalkoor, M. A., **Jha, S. K.** and Jinsy Anish. (2015). Growth performance evaluation of selected tropical tree species for further assortment. *Int. J. of Usuf. Mngt.* **16** (1): 55-66
 23. Jani, J. N., **Jha, S. K.**, & Nagar, D. S. (2015). Root explant produces multiple shoot from pericycle in *Psoralea corylifolia*—a leprosy destroyer medicinal plant. *Industrial Crops and Products*, **67**: 324-329.
 24. Nagar, D. S., **Jha, S. K.**, and Jani, J. (2015). Direct adventitious shoot bud formation on hypocotyls explants in *Millettia pinnata* (L.) Panigrahi—a biodiesel producing medicinal tree species. *Physiology and Molecular Biology of Plants*, **21**(2): 287-292.
 25. **Huse, S. A.**, N. B. Singh, P. Choudhary, J. P. Sharma, I. K. Thakur and R. K. Anand. (2015). Variability Estimate of Growth and Physiological Parameters among Commercially Important Tree Willows. *Indian Forester*. Vol. 141(5): 505-513pp.

Lecture Notes/Teaching manual/Practical Manual

1. D. T. Desai, M. U. Kukadia and **S. K. Jha**. (2007). Seed Technology. ACHF, Navsari Agricultural University, Navsari.
2. M.B. Tandel, M.U. Kukadia and **S. K. Jha**. (2007). Plantation forestry. ACHF, Navsari Agricultural University, Navsari.
3. **S. K. Jha** and Sanjay Attar. (2011). Tree breeding and improvement: a practical manual. ACHF, Navsari Agricultural University, Navsari.
4. **R. S. Chauhan, S. K. Jha** and N. S. Thakur. (2012). Tree seed Technology. ACHF, Navsari Agricultural University, Navsari.
5. **S. A. Huse** and B. S. Desai. (2012). Dendrology: a Practical Manual. ACHF, Navsari Agricultural University, Navsari. 82pp.
6. **S. A. Huse** and Rajesh P. Gunaga. (2013). Lecture Notes on Tree Improvement. ACHF, Navsari Agricultural University, Navsari. 90pp.
7. Pathak Jayesh, V. B. Parekh, **S. A. Huse**, M. R. Parmar, S. M. Patel and M. Desai. (2015). Vasni Mukhya Prajatiyo. ACHF, Navsari Agricultural University, Navsari. 18p.
8. **S. A. Huse** and Rajesh P. Gunaga. (2015). Teaching Manual: Nursery Management. ACHF, Navsari Agricultural University, Navsari.

Book chapters/ Full length papers in proceeding/ Edited Book/International Books

1. D.B. Jadeja, N. L. Patel, **S. K. Jha**, D. Nayak, D. J. Parekh, M. B. Tandel, V. M. Prajapati, M. R. Chamar (eds.). 2008. Abstract book of National seminar on Interventions for environmental moderation. Navsari Agricultural University, Navsari.
2. **S. K. Jha** and R. N. Sehgal. 2012. Evaluation of open pollinated families of *Dalbergia sissoo*. LAP Lambert Academic Publishing, Germany.
3. **R. S. Chauhan, S. K. Jha** and S. Jha. 2012. *In vitro* regeneration of *Acacia mangium* Willd. pathways for mass multiplication. LAP Lambert Academic Publishing, Germany.
4. A. Hake, S. Jha and **S. K. Jha**. 2012. Molecular and Biochemical characterization of Karanja (*Derris indica*): An approach towards tree breeding. LAP Lambert Academic Publishing, Germany.
5. R. V. Kansara, S. Jha and **S. K. Jha**. 2012. *In vitro* Regeneration and Genetic Transformation of *Ricinus communis*. LAP Lambert Academic Publishing, Germany.
6. V. Parekh, K. Vardhan, **S.K. Jha**, Sanjay Jha, M. K. Mahatma, M. R. Parmar and Jayesh Pathak. (2012). Forest biotechnology: current status and future perspective. National seminar on Agroforestry: An evergreen agriculture for food security and environmental resilience, 2 to 4 February 2012. 297- 304.
7. Santoshkumar A. V., **R. P. Gunaga, S. K. Jha** and **S. A. Huse**. (2014). Tree Improvement In: Vikas Kumar and T. K. Kunhamu. 2014. A Question Bank of Forestry. Narendra Publishing House, Delhi.
8. Vikas Kumar, S. K. Sinha, **S. A. Huse** and **R. P. Gunaga**. (2014). Introduction: A Question Bank of Forestry In: Vikas Kumar and T. K. Kunhamu. 2014. A Question Bank of Forestry. Narendra Publishing House, Delhi.

Research papers published in seminar/workshop/conference

- 1) Sharma, Y., Gupta N.K. and **Jha S.K.** (2008). Floristic composition of Bashala forest range in Himachal Pradesh. National Seminar on Interventions for Environmental Moderation, Navsar, 8-10 January, 2008.
- 2) Sharma, Y., Gupta N.K. and **Jha S.K.** (2008). Stand characteristics of fir and spruce at different elevations in Bashala forest range. National Seminar on Interventions for Environmental Moderation, Navsari, 8-10 January 2008.
- 3) Mehta A.A., **Jha S.K.**, Nayak, D., Pathak Jayesh, Tandel, M.B., Vashi, B.G. and Jadeja, D.B. (2008). Recent advances in cryopreservation and its applicability to forestry- a critical review. National Seminar on Interventions for Environmental Moderation, Navsari, 8-10 January 2008.
- 4) **Jha, S. K.**, Mahatma, M.K., Khandelwal, V., Patel, N.B., Kapadia, C., Vyas, K. And Shah, R.R. (2008). Molecular variability among 15 year old plantation of *Casuarina equisetifolia* insouth Gujarat, National Seminar on Interventions for Environmental Moderation, Navsar, 8-10 January 2008.
- 5) M. K. Mahatma, V. Khandelwal, **S. K. Jha**, V. Kumar and R. R. Shah. (2008). Biochemical characterization of cotton (*Gossypium hirsutum*) genotypes for water stress. Golden jubilee Conference on Challenge and Emerging strategies for improving plant productivity, 12-14 Nov. IARI, New Delhi.

- 6) D. Nayak, N. S. Patil, **S. K. Jha** and D. B. Jadeja. (2009). Gamma rays induced variability in *Jatropha curcas* L. National seminar on emerging areas in Plant sciences, 22nd Feb 2009, M.S. University, Baroda.
- 7) V. Solanki, V. Khandelwal, D. H. Patel, Taslim Ahmed, Sanjay Jha, **S. K. Jha**, M. K. Mahatma, V. Kumar and R. R. Shah. (2009). In planta transformation in cotton variety G. Cot. 10. National conference on cotton.
- 8) **Huse S. A.**, N. B. Singh, S. K. Jha, R. K. Anand and J. P. Sharma. (2011). Tree Willows: a multipurpose tree species of western Himalayas. In: Proceedings of National seminar on Forest Resources: Diversity, Utilization and Conservation. UAS Begaluru. 63p.
- 9) **R. S. Chauhan** and **S. K. Jha**. (2011) In vitro regeneration of *Acacia mangium* Willd. First Indian Forest Congress, Indian Council of Forestry and Education, 22nd to 25th November 2011, NASC Complex, New Delhi.
- 10) R. K. Luna, N. S. Thakur, **S. K. Jha**, Harsha Hegde and **R. S. Chauhan**. (2012). Productivity of fast growing exotic tree species under different land use systems: case studies from Punjab. National seminar on Agroforestry: An evergreen agriculture for food security and environmental resilience, Navsari, 2-4th February, 2012.
- 11) N. S. Thakur, A.H Suvera, **S. K. Jha**, S. K. Attar, Harsha Hegde and **R. S. Chauhan**. (2012). Non timber forest products from agroforestry: need to divulge the potential for multifarious needs of people and industry. National seminar on Agroforestry: An evergreen agriculture for food security and environmental resilience, Navsari, 2-4th February, 2012.
- 12) S. K. Gupta, **S. K. Jha**, S. K. Sinha, L. K. Behra, M. R. Parmar, S. S. Koyande and D. B. Jadeja. (2012). Aboveground biomass estimation of different eucalyptus clones. National seminar on Agroforestry: An evergreen agriculture for food security and environmental resilience, Navsari, 2-4th February, 2012.
- 13) Hake A. A., Sanjay Jha, **S. K. Jha**, M. K. Mahatma, V. B. Parekh, Diwakar Singh, K. P. Suthar and Taslim Ahmad. (2012). Molecular and biochemical characterization of Karanja (*Derris indica* L.). National seminar on Agroforestry: An evergreen agriculture for food security and environmental resilience, Navsari, 2-4th February 2012.
- 14) **R. S. Chauhan**, **S. K. Jha**, Jayesh Pathak and N. S. Thakur. (2012). *In vitro* regeneration of *Acacia mangium* Willd. Via indirect organogenesis. National seminar on Agroforestry: An evergreen agriculture for food security and environmental resilience, Navsari, 2-4th February, 2012.
- 15) **Huse S. A.**, Singh N.B., Sharma J.P. and Anand R.K. (2012). Evaluation of Arborescent Willow Clones for Growth at Nursery Stage. In: Report of 24th session of FAO-International Poplar Commission (IPC-2012), FAO, Rome, Italy. Dec-2004. 22p.
- 16) Singh N.B., Sharma J.B., Chaudhary Punit, **Huse S.A.** and Thakur Sanjeev. (2012). Willow Improvement in India: Present Status and Future Possibilities. In: Report of 24th session of FAO-International Poplar Commission (IPC-2012), FAO, Rome, Italy. Dec-2004. 50-52pp.

POPULAR ARTICLES

- 1) Anand R. K., S. Singh and **S. A. Huse.** (2011). Prakritik sansadhanoka Mahattva, Rakh-rakhav evam Jan Sahbhagita (Importance of Natural resources, management and people's participation.) In: Shriram Singh *et al.* Eds. 2011. Samekit Jal Sansadhan Prabandhan (Integrated Water Resources Management). Kala Prakashan, B.H.U. Varanasi. 11-21 pp.
- 2) Jadeja D. B., B. S. Desai, J. Pathak and **S. A. Huse.** (2012). “*Imarati Vriksha: Hed*”. In: Patel, N. L. *et al.* 2012. Agroforestry ane High-tech Horticulture Parisanvad. NAU, Navsari pp. 14.
- 3) Prajapati, V. M., M. B. Tandel, M. K. Desai and **S. A. Huse.** (2013). *Gujaratma clonal paddhatithi Vrikshonu sanvardhan* (Clonal Tree Propagation in Gujarat). Krishigovidhdyo. 66: 07:12-15pp.