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**REPORT OF HARC-QCL**

HIGH ALTITUDE RESEARCH-QUALITY CONTROL LABORATORY  
FOREST AND ENVIRONMENT DEPARTMENT

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# PROGRESS DURING PANDEMIC IN HARC-QCL AND ITS PROSPECTIVE

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## **Abstract**

The Sikkim Himalaya is the potential region having good populations of bioresources playing valuable roles in economic, social, cultural and ecological aspects of local communities, unequivocally across the world over. Bioresources bear the active principles both in volatile and non-volatile forms which are in use within the communities since time immemorial. These plants are used for food, nutraceutical and healing purposes.

The traditional healing mechanism of the Sikkim Himalaya involves the aromatic compounds as well as the non-volatile compounds, of which inhaling of volatile compounds are most common. These plants are grown in the different altitudinal gradients and some species are endemic to the regions. Thus, the traditional system of Himalayan region is unique. The usages of plants and treatments differ among the communities of Sikkim provide the diversified uses of biodiversity. Increasing the population densities in the Himalayan regions and its known uses as well as the unregulated market cause certain depletion of some species which warrant more focus on the systemic planning of bioresources development.

Further, there are certain discrepancies in the identification of the bioresources and taxonomic validation, thus, the HARC-QCL has strengthened the Herbarium at Level 1, HARC QCL, F&ED as well as other support system.

Apart from this, there are many research activities conducted to support the bioresources of Sikkim. Henceforth, this report comprised of recordings of progress during pandemic in HARC-QCL.

## **Introduction**

Sikkim Himalaya is the treasure house of high valued resources. These resources studied by the several authors in the recent past (Griffth, 1947; 1848; King and Pantling, 1898; Hooker and Thomson, 1955; Hooker, 1872-1897; Hara, 1966, 1971; Biswas and Chopra, 1956; Grierson and Long, 1982). The State Government initiated several projects to explore the bioresources making the sustainable livelihood (HCCD, GOS, 2009; SMPB, 2010-2020).

In addition, this report includes the recent studies and development in the scientific findings of bioresources of Sikkim (Pradhan and Maity, 2021; Pradhan, 2020a; 2021a, 2021b; Midday et. al., 2020; Pradhan et al., 2021; Bhutia, 2020).

## **Enumerations of activities in Pandemic as well as about HARC-QCL approach**

### **PART I**

## **ACTIVITIES IN PANDEMIC**

The COVID hit all spheres of life and it does affect to the laboratory activities also. Even in the difficult time, the office of HARC-QCL performed duties to produce the fruitful results. Though

the situation was not easily, the details activities were conducted following the COVID protocol wherever applicable.

All initiatives and efforts are documented as under:-

### **I. Publication of the Proceedings**

During the initial period of pandemic, the proceeding of the seminar published having the contribution of scientific papers from the different institutions, Department and Universities.

On 8<sup>th</sup> November, 2019, the national seminar conducted on the marketing of medicinal plants and high valued bioresources of Sikkim and adjoining North East region. The National seminar was inaugurated by the Honourable Minister of Forest and Environment Department, GOS. The participants of the seminars were from the different parts of the country, universities, colleges, JFMC, EDC, growers, buyers and sellers.

### **II. Soil and water analysis of Sikkim Forest nurseries covering all four districts**

The Soil and Water samples of the Sikkim Forest nurseries investigated in the Quality Control Laboratory-HARC, F& ED (Pradhan, 2020b). The parameters covered during the study were as under:

**Physical properties:** pH, conductivity, Specific Gravity, TDS, Soil Moisture

**Macronutrients analysis :** NPK, Nutrients

**Soil Chemistry:** Phenolic Acid, Flavanoids in soil, Fulvic Acid, Humic Acid, Soil Organic Carbon etc.

### **III. Establishment of the Sikkim State Forest Herbarium having acronym SSFH**

In accordance to the Office Order 1795/ADM/F&ED/15/05/2020, the Principal Scientist took the the charge of Herbarium and transformed the herbarium into functional unit with international standard having acronym SSFH (Sikkim State Forest Herbarium), the later was notified also. All specimens were remounted and improved . All activities such as remounting, changing the herbaria sheets, making all fresh herbarium, nomenclature, type specimens designation and publications etc were performed. (Pradhan, 2020a, Pradhan, 2021, Pradhan et al., 2021, Pradhan and Maity, 2021)

#### **IV. Water analysis of the important Wetlands of Sikkim**

The water samples of the important wetlands of East district were analyzed as per the requisition for the Wetland proposal of Sikkim. Noted that it was posed to the Ministry for the necessary funding.

#### **V. Effluent analysis of Pharmaceutical companies**

The effluents of the Pharmaceutical companies tested and analyzed heavy metals and toxicity, as desired by Land Use and Environment Sector of Forest and Environment Department. Accordingly, the reports generated on the status of the effluents.

#### **VI. Honey sample of Sikkim Khadi and Village Industries Board and Bee farmers**

Honey of the Bee farmers analyzed to test quality and purity, and promote the entrepreneurship skill.

#### **VII. National and International Relationship**

##### **1. International collaboration**

With the approval of the competent authority, the Principal Scientist was designated as the nodal officer to coordinate the Frankfurt Innovation Zentrum, Germany.

##### **2. National collaboration**

As per the mandate of the HARC, the HARC may undertake the collaboration work with the premier institutions of the nation. Therefore, with the approval of State Government, the HARC is working in collaboration with the Calcutta University.

#### **VIII. Achievements / recent publications**

1. Folk –Medicinal Uses of *Allium sikkimese* Baker (Alliaceae) in Sikkim Himalaya. Explor. Anim. Med. Res. 2: 217-220, 2020.
2. Enumeration of specimens from Edinburgh Expedition to Northern Sikkim deposited at Sikkim State Forest Herbarium-Part I. Pleione 14(2): 202-215, 2020.
3. Phytogeography of Saxifragaceae and Crassulaceae in the Sub-Alpine and Alpine Sikkim Himalaya. In: Trends in Bio-Geography: Eastern Himalaya and North Bengal (In press).

4. Enumeration of Poaceae specimens of Edinburgh expedition to Northern Sikkim deposited at Sikkim State Forest Herbarium (SSFH) Pleione 15(1): 45-49, 2021
5. Plants of Sikkim Himalaya used in Tibetan Medicine. Pleione 15(1):23-31, 2021.
6. Do invasive species use for the medicinal purposes: Indian forester (in press)
7. Notes on the typotype *Juncus tobdenii* Noltie in the Sikkim Himalaya: Indian Forester
8. Checklist of Lepcha Clans (2021): Trends in Bio-Geography: Eastern Himalaya and North Bengal.
9. Proceeding “Natural Resources of Eastern Himalaya- Research Trends and opportunities -2020. ISBN : 9788194625803.
10. Report on National Seminar on Marketing of Medicinal Plants and High Valued bioresources of Sikkim and adjoining North East States, funded by NMPB, AYUSH, GOI.
11. Wild Edibles and Fodder Plants of Sikkim. ISBN 978-93-5408-409-6.

#### **IX. New initiatives of HARC during the pandemic**

##### **1. Establishment of Sikkim State Forest Herbarium**

Sikkim State Forest Herbarium notified vide 184/ GOS/ FED/ SECY on 9.11.2020 having its acronyms SSFH. In addition, the State Government approval obtained for the prescribed rules of SSFH.

##### **2. Taxonomic treatment**

Typification is significant for the documentation of the biological resources of Sikkim which shall represent the representative specimens for the nation and the world.

Task started.

##### **3. Documentation of specimens of Japanese Expedition.**

All representative specimens of the Japanese expedition mounted and archived.

Taxonomical works is yet to be completed.

#### **X. Initiatives in fiscal year 2021-2022**

Even though the pandemic disease is/ was around, the following activities undertook from April, 2021 till June, 2021:

1. Online dynamic web based format preparation for the updating of the data of research for the public benefits through the portal [sukhimsanjeevani.org](http://sukhimsanjeevani.org)
2. Constituted the Editorial Advisory Committee of the journal having distinguished personalities of flora and fauna. All consents were obtained from the distinguished authorities.
3. Preparation for launching of Inaugural journal : Science of the Eastern Himalaya Journal on 15<sup>th</sup> August, 2021.

## XI. INTER-DEPARTMENTAL AND BOARD INTERACTIONS

### 1. Social Welfare Department

There were numbers of inter-departmental meetings initiated. As per the directive of the Chief Secretary to the Social Welfare Department, Government of Sikkim, the team of the Social Welfare Department visited the office of HARC-QCL for the nutraceutical analysis of products. After the meticulous discussions on the requirements of the department, the suitable modulus operandi was prepared for the consideration of the Department of Social Welfare that includes the analysis of the active principles, nutraceutical constituents as well as heavy elements. However, the office of HARC-QCL has not yet received any update till date.

### 2. Cooperative Department

Similarly, the meeting held with the Cooperative Department, GOS regarding the active constituents analysis. The office of HARC-QCL had an elaborate discussion on the matter and sort out the strategy to address the technical matter of the Turmeric cluster growers. The matter is processed for the consideration.

### 3. SIMFED

The state marketing agency, SIMFED, interacted with the office of HARC-QCL for the testing of produces. The representative OF SIMFED discussed on the several technical issues however, so far, no such proposal in writing received from the SIMFED.

### 4. Sikkim Khadi and Village Industries Board

Sikkim Khadi and Village Industries Board communicated for the honey test for entrepreneurship development. The sample was tested.

### 5. Sikkim Government Fruit Factory, Singtam



The Managing Director of Sikkim Government Fruit Factory interacted for the technical inputs for the establishment of laboratory in the factory premise.

#### **6. Horticulture and Cash Crop Department**

The Head of the Engineering Cell of Horticulture and Cash Crops Dept (HCCD), GOS and the team interacted for the technical inputs for the establishment of laboratory in the HCCD premise. The team under the leader of the Engineering Head, Horticulture noted all requirements from the office of HARC-QCL.

#### **7. ENVIS –FEWMD**

For the entrepreneurship of bee farmers, the honey test was conducted for farmers. The requisition was made by ENVIS.

## **PART II**

### **SALIENT FEATURES OF QCL HARC, FOREST AND ENVIRONMENT DEPARTMENT, GOVERNMENT OF SIKKIM:**

1. As per the guidelines of the Ministry of Food Processing and Industries, Government of India and the Cabinet Memorandum of Government of Sikkim 121/GOS/FEWMD/PCCF/P.S dated 13. 08. 2015, the Quality Control Laboratory established;
2. In pursuance to the Sikkim Government Notification No 85 dated 07 March, 2018, the Quality Control Laboratory of HARC, Forest and Environment Department, Government of Sikkim performs biological, chemical, phytochemical, nutraceutical and such related activities of food, soil, water, microflora, flora and fauna;

#### **PARAMETERS OF QCL, FEWMD, GOS**

**Chemical Parameters:** Elemental Analysis, Trace elements

**Biological Parameters:** Microbes, Toxicity

**Phytochemical Parameters:** Flavanoids, Phenolic acid, Active Constituents of raw materials, Tannin, Sterol and such related compounds

**Nutritional Parameters:** Macronutrients elements, Micronutrients elements

**Biochemical Parameters:** Carbohydrate, Fats, Proteins, Aminoacids, Proline, Energy estimation etc

**Physical Parameters:** Refractive Index, Conductivity, Sugars, Optical rotation, pH, Moisture, Ash

**Microscopic Analysis**

### **PART III**

#### **OVERVIEW ON THE SCIENTIFIC TESTING TRENDS, STRATEGIES AND PLANNING FOR THE WIDE CIRCULATION**

Sikkim is a mountainous state in the Eastern Himalayan region extending approximately 114 km from North to South and 64 km from East to West having the total geographical area 7096 sq. km only. The State is in between  $88^{\circ} 00' 58''$  and  $88^{\circ} 55' 25''$  East longitudes and  $27^{\circ} 04'$  and  $28^{\circ} 07' 48''$  North latitudes surrounding by vast stretches of Tibetan plateau in North; Nepal in West, Bhutan in the East; and West Bengal in South.

At the outset, this is an interesting point to put forward that the Sikkim Himalaya is a part of Eastern Himalaya having biological significances across the globe. Sikkim endowed with rich natural resources and phytogeographically identified as hot spot of Biodiversity under Eastern Himalaya. Sikkim has the alpine Himalayas prairies to tropical hills with majestic beauty representing 0.22 % of total geographical area of country.

In connection thereto, Sikkim is strategically significant state for maintaining the mountainous water like Teesta river which is a lifeline of West Bengal, Burma and Bangladesh . This international river, Teesta, originates from Sikkim and harness water from all tributaries of watersheds of Sikkim and other hills. This river is 196 miles (315) km long and approximately 115 km of its stretch is situated in Bangladesh. Thus, the watershed under the Teesta and its basin is significant.

This beautiful land has the tremendous potentials in bioresources which needs to be explored. It requires the scientific testing trends, strategies and planning.

The following point were noted to address the gaps of testing trends of Sikkim:

**a) Marginal farmers**

The approximately 11% of the land of Sikkim is under the agriculture. The farmers do possess marginal land for the cultivation. All lands are not connected by the road and infrastructure for the agricultural practices. These marginal farmers do not have the knowledge of scientific validation. Whatsoever they produce, they fetch the price of the nearest markets for their livelihood.

Besides, few areas of the Sikkim are producing the crops in clusters which are insufficient to the requirement of medium and large industries. So, the stakeholders are unaware and cannot able to avail the facilities of test.

**b) Government agencies**

The transparency in the governmental agencies needs to strengthen so that the stakeholders can obtain the benefits. The researches and scientific validation must be obtained from the authorized personnel before the execution of the work, to validate the scientific analysis.

The policy must be framed to categorize the research work earmarking the designated budget.

**c) International Trade**

Sikkim can perform the international trade in the biological resources doing some technical validation and collaboration. However, to get through, the systemic addressing of produces, strategies and single gateway for the management require.

This trade requires the certificate of produce having chain of custody (COC).

**d) National Trade**

Some resources of Sikkim are in trade in national level based on the transit permit rather than the certificate of test result.

**e) Convergence**

The convergence of the company, NGO, firm , entrepreneurs and government is necessary.

**f) Gaps in addressing the Pharmaceutical companies and other large scale company**

The sample test analysis of the pharmaceutical companies must be mandatory. Check and verification mechanisms of pharmaceutical companies, medium and large scale industries must be adopted for the generation of revenues for the state.

**g) Initiative to the small scale entrepreneurs**

Providing the corpus fund , the Government can provide the quality tests' result to the farmers, growers and the stakeholder subjected to the terms and conditions.

**h) Regional / Local Market**

To strengthen the regional market, the certificate of test might be useful for the value addition.

**Conclusion**

The scientific validation shall provide the information of the contents of produces and sources. It is the safety protocol for the healthy living.

HARC-QCL is providing the support to the different spheres providing technical inputs, literatures supports and testing supports.

The mandate of the HARC is to conduct the researches on the different aspects of the bio-resources, so, it is rendering the technical inputs for qualitative results.

**Literature cited.**

Bhutia, C. 2020. *Status of Forest Nurseries 2020-2021*, FEWMD, GOS.

Biswas, K. and Chopra, R.N. 1956. *Common Medicinal plants of Darjeeling and Sikkim Himalayas*, Soni Reprint, New Delhi.

Grierson A.J.C and Long, D.G . 1983. *Flora of Bhutan. Vol 1(1)*, Edinburgh, Royal Botanic Garden, Edinburgh.

- Griffith, W. 1847. *Journals of Travels in Assam, Burma, Bootan, Affghanistan and the Neighbouring Countries*. Vol. 1, Bishop's College Press, Calcutta.
- Griffith, W. 1848. *Itinerary Notes of plants collected in the Khasyah and Bootan Mountains, 1837--8, in Affghanisthan and Neighbouring Countries 1839 to 1841*. Vol 2, John McClelland, F.L.S., J.F. Bellamy, Calcutta.
- Hara, H. 1966. *The Flora of Eastern Himalaya*, First Report, University of Tokyo, Japan.
- Hara, H. 1971. *The Flora of Eastern Himalaya*, Second Report, The University of Tokyo Press, Japan.
- Hooker, J.D. 1872-1897. *The Flora of British India Vol. 1--*, Reeve & Co., Kent, London.
- Hooker, J.D and Thomson, T. 1855. *Flora Indica Vol. 1*. London.
- King, G. and Pantling R. 1898. *The Orchids of the Sikkim-Himalaya*, The Bengal secretariat Press, Calcutta.
- Midday, M., Ghosh, J., Pradhan, D.K. and Maity, D. 2020. Folk –Medicinal Uses of *Allium sikkimese* Baker (Alliaceae) in Sikkim Himalaya. *Explor. Anim. Med. Res.* 2: 217-220.
- Pradhan, D.K. 2020a. Enumeration of specimens from Edinburgh Expedition to Northern Sikkim deposited at Sikkim State Forest Herbarium-Part I. *Pleione* 14(2): 202-215.
- Pradhan, D.K. 2021. Phytogeography of Saxifragaceae and Crassulaceae in the Sub-Alpine and Alpine Sikkim Himalaya. In: *Trends in Bio-Geography: Eastern Himalaya and North Bengal* (In press).
- Pradhan, D.K. 2021. Enumeration of Poaceae specimens of Edinburgh expedition to Northern Sikkim deposited at Sikkim State Forest Herbarium (SSFH), *Pleione* 15(1): 45-49.
- Pradhan, D.K. and Maity, D. 2021. Plants of Sikkim Himalaya used in Tibetan Medicine. *Pleione* 15(1):23-31.
- Pradhan, D.K., Lepcha, N and Thapa, K. 2021. Checklist of Lepcha Clans. In : *Trends in Bio-Geography: Eastern Himalaya and North Bengal* (in press), 2021.
- Pradhan, D.K. 2020b. *Sikkim Forest Nurseries 2019-2020*, HARC, FEWMD.