(Ref: F. No. 42-969/2013 (SR) dt.14.03.2013)

Final Report on

Phytochemical Profiling, Bioactivity and *Invitro* Propagation of Endangered Medicinal Plant *Decalepis hamiltonii* "Wight &Arn"

ज्ञान - विज्ञानं विमुक्तये

Submitted to

UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI-110 002

Submitted by

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PORFORMA FOR SUBMISSION OF INFORMATION AT THE TIME OF SENDING THE FINAL REPORT OF THE WORK DONE ON THE MAJOR RESEARCH PROJET

1.	UGC Reference No. & Date	F.42-969/2013(SR) dated 14.3.2013
	U.G.C. Extension Letter No and Date	F.42-969/2013(SR) dated 25-03-2016
2.	Name of the Principal Investigator	**Dr. R. MANIVASAGAPERUMAL**
3.	Address	**Assistant Professor** **Botany wing (DDE)** **Annamalai University**, Annamalainagar-608 002. Tamilnadu, India. Mobile: **9443411711** E-mail: rmvperumal@gmail.com
4	Department and University/ College where the project has undertaken	**Botany wing(DDE)** **Annamalai University.**
5.	Title of the Project	**Phytochemical Profiling, Bioactivity and Invitro Propagation of Endangered Medicinal Plant *Decalepis hamiltonii* "Wight & Arn**
6.	Date of Implementation	**14-03-2013**
7.	Tenure of the project	4 years (01-04-2013 to 31-03-2017)
8.	**Total Grant Allotted**	Rs. **10,88,300.00/-**

	Total Grant Released	**1st Instalment : Rs. 6,36,800.00/-** **2nd Instalment : Rs. 3,61,200.00/-** **Total : Rs. 9,98,000.00/-**
9.	**Total Expenditure** **Unspent amount to be returned to UGC**	**Rs. 9,56,696.00** **Rs. 41,304.00**

10. OBJECTIVES OF THE PROJECT:

- **To carry out qualitative and quantitative phytochemical analysis of secondary metabolites**
- **To conduct the bioactive assays of the plant for biological evolution.**
- **Isolation of chemical constituents from the root extract by Thin Layer Chromatography and Colum Chromatography**
- **To identify the chemical composition by GC-MS, FTIR, 1H NMR, 13C NMR, HPLC and Molecular docking.**
- **Multiplication of Decalepis hamiltonii through Invitro prorogation.**
- **To achieve restoration of Decalepis hamiltonii and make recommendation for future conservation.**

11. WHETHER OBJECTIVES WERE ACHIEVED(GIVE DETAILS)

The major objective of the project is to get to know the chemical constituents and Pharmacological activities of *Decalepis hamiltonii*. The project work helps in getting to know *Decalepis hamiltonii* has considerable antimicrobial, antioxidant, anti diabetic and anti–inflammatory activities. The phytochemical study reveals the presence of major compounds which may be highly responsible for their Pharmacological activities. The objective widens in analyzing the antidiabetic and anti-inflammatory metabolism through molecular docking studies. Invitro regeneration studies achieved through shoot tip segments of *Decalepis hamiltonii* with combined growth regulators.

12. ACHIEVEMENT FROM THE PROJECT:

- The data collected in the present study on different phytochemical studies will be useful for the production of bioactive components and novel drugs.
- The present investigation clearly demonstrated that the methanol root extract exhibited broad spectrum of antimicrobial activity.
- Systematic studies made on the antioxidant, antidiabetic, anti-inflammatory activity of *Decalepis hamiltonii* was found to have considerable bioactive properties. The potential extract of *Decalepis hamiltonii* root was analyzed for GC-MS, FTIR, HPLC, ^{1}H NMR and ^{13}C NMR. The extract showed the presence of three major compounds such as 2-Hydroxy-4-methoxybenzaldehyde ($OHC_6H_3C(OH_3)CHO$), Hexadecanoic acid ($C_{16}H_{32}O_2$), Cis-vaccenic acid($C_{18}H_{34}O_{2)}$ in GC-MS analysis, major functional group 3962.64 cm^{-1} assigned to OH stretching of Phenol groups as in FTIR analysis and two major compounds such as Gallic acid and Benzoic acid in HPLC studies. These compounds may be highly responsible for their antimicrobial, antioxidant, antidiabetic and anti-inflammatory activities.

- Docking studies were performed with 3V6R, PBRγ, 4XIA and 5HTG protein using Arguslab indicate the bioactive compounds can be considered as activators of insulin receptor and JNK pathway receptor for antidiabetic and anti-inflammatory.
- Regeneration from shoot tip segment of *Decalepis hamiltonii* has been carried out in the present work. Invitro propagation studies. All the regeneration plants survived were transferred successfully in the fields.

13. SUMMARY OF THE FINDINGS

The phytochemical constituents of different parts of leaf, stem and root of *Decalepis hamiltonii* (which were extracted using different solvents *viz.*, Petroleum ether, Chloroform, Ethyl acetate and Methanol) were analyzed. The results revealed that the Methanol root extract of *Decalepis hamiltonii* contained stronger phytochemicals such as saponins, steroids, tannins, phenolic compounds terpanoids, alkaloids, flavanoids, glycosides and carbohydrates than leaf and stem.

The results clearly demonstrated that the methanol root extract of *Decalepis hamiltonii* exhibited broad spectrum of antimicrobial activity. The intensity of the antimicrobial activity varied depending on the microorganism. With reference to the organisms, *Staphylococcus epidermis* inhibited best by the methanolic root extracts.

The results showed that the root and leaf of *Decalepis hamiltonii* were found to have considerable antioxidant activities. The highest free radical scavenging activities were observed in methanol root extract of *Decalepis hamiltonii* when compared to leaf and stem standards.The results showed that the methanolic root extract of *Decalepis hamiltonii* was found to have considerable antidiabetic and anti-inflammatory activities.

The potential extract of *Decalepis hamiltonii* root was analyzed for GC-MS, FTIR, HPLC, ^{1}H NMR and ^{13}C NMR. The extract showed the presence of three major compounds such as 2-Hydroxy-4-methoxybenzaldehyde ($OHC_6H_3C(OH_3)CHO$), Hexadecanoic acid ($C_{16}H_{32}O_2$), Cis-vaccenic acid($C_{18}H_{34}O_{2)}$ in GC-MS analysis, major functional group 3962.64 cm^{-1} assigned to OH stretching of Phenol groups as in FTIR analysis and two major compounds such as Gallic acid and Benzoic acid in HPLC studies. These compounds may be highly responsible for their antimicrobial, antioxidant, antidiabetic and anti-inflammatory activities. The NMR spectral studies confirmed the presence of the major compound 2-Hydroxy-4-methoxybenzaldehyde.

Docking studies were performed with 3V6R, PBRγ, 4XIA and 5HTG protein using Arguslab. From the Arguslb studies the best pose was obtained with least energy value. The interaction with active site such as 4XIA -7.45 kcal/mol, 5HTG -7.85 kcal/mol, 3V6R -17.6025 kcal/mol and PBRγ protein -12.623 indicate that these compounds can be considered as activators of insulin receptor and JNK pathway receptor for antidiabetic and anti-inflammatory.

The results of Invitro shoot multiplication of *Decalepis hamiltonii* revealed that MS medium supplemented with BA (0.886 mg/l)+2ip(0.24 mg/l) showed significantly high shoot length (2.9 ± 0.18). Hardening is done by transferring the explant to plastic cup contain red soil sand and vermic compost in the ratio 1:1:1. Through this process of acclimatization, regenerated plantlets were established under filed conditions.

Further investigations into the pharmacological importance of *Decalepis hamiltonii*, their diversity and detailed Phytochemistry may add new knowledge to information in the traditional medicinal systems.

14. CONTRIBUTION TO THE SOCIETIES

Several of the plants used in ancient folk and traditional medicine are often not subjected to scientific scrutiny. The experimental proof of the claimed benefit or curative property is lacking. It is imperative that the beneficial or medicinal efforts be subjected to scientific testing and the active principles isolated. *Decalepis hamiltonii* is one such plant whose beneficial effects have not been subjected to scientific investigations. It is hoped that, the results obtained from this work will give a sound scientific basis for the health promoting potential of *Decalepis hamiltonii*

The scientific research on *D. hamiltonii* suggests that this plant has huge biological potential. It is strongly believed that the detailed information regarding phytochemistry and various biological properties presented in this paper providing evidence for use of this plant in curing various ailments.

A number of phytochemicals were isolated from the roots of *D. hamiltonii*. The phytochemicals exhibited different structural characteristics with various pharmacological actions. The information provided in this study is them used to discover new bioactive natural products that may serve as a lead to the development of new pharmaceutical drugs.

To develop new drugs it is important to know the mode of action of that particular active principle in human beings. This could be achieved by our molecular modeling studies involving the interaction of bioactive molecules with respective target sites

Due to its over exploitation and habit destruction, this plant has become endangered in its habit. Hence in vitro regeneration were done in this project which will help successful conservation and commercial cultivation of this plant.

15. NUMBER OF PUBLICATIONS OUT OF THE PROJECT

1. **Prakash,P,** G. Thiyagarajan, Rengarajan Manivasagaperumal, 2014. "Phytochemical screening and Antibacterial activity of root extracts of *Decalepis hamiltonii* Wight & Arn *International Journal of Pharma Research & Review*., 3(11)
2. **Prakash. P**., R. Manivasgaperumal and G. Thiyagarajan" In Vitro Antifungal Activity of Root Extracts of *Decalepis hamiltonii* Wight & Arn *International Journal of Research in Plant Science* 2014; 4(4): 81
3. **Prakash, P.** and R. Manivasagaperumal and G. Thiyagarajan 2015. Phytochemical screening and GC-MS analysis of methanolic root extracts of *Decalepis hamiltonii* Wight & Arn. *International Journal of pharmaceutical and Drug analysis.*, **3(1)**:1-5
4. **Prakash, P.** and R. Manivasagaperumal, 2016. Invitro antioxidant activity of methanolic root extracts of *Decalepis hamiltonii* Wight & Arn. *International Research Journal of Pharmacy,* **7(8):** 84-89.
5. **Prakash, P.** and R. Manivasagaperumal, 2016. Antimicrobial activity of methanolic root extracts of *Decalepis hamiltonii* Wight & Arn. *International Letters of Natural Sciences.,***56: 52-56**
6. **Prakash. P**., R. Manivasagaperumal "Anti-Inflammatory activity and Insilco Approaches on root extract of *Decalepis hamiltonii* Wight & Arn British Journal of Pharmaceutical Research 2017;18(2);1-8
7. **Prakash. P**., R. Manivasagaperumal "Anti-diabetic activity and Insilco Approaches on root extract of *Decalepis hamiltonii* Wight & Arn *International Journal of pharmaceutical research and review* 2017;45 (1);199-205
8. **Prakash. P**., R. Manivasagaperumal "Insilco Analysis of active compounds has potential inhibitors against diabetic *International Journal of pharmacy and biological science* 2017;12(4);44-49
9. **Prakash. P**., R. Manivasagaperumal "Insilco Analysis of active compounds has potential inhibitors against lung cancer *International Journal of pharmaceutical research (Accepted manuscript no: 8936/07-17)*

16. SEMINAR AND WORKSHOP

1. National Symposium On "**Cultural landscapes indigenous knowledge and biotechnological tools And biodiversity Conservation"** held at Kongunadu Arts and Science College, Coimbatore, on 7th & 8th March 2014
2. National Conference on "**Challenges Future Prospective of Plant Science NCP-2015**" October 7th & 8th Department of Botany, School of life Science, Periyar University, Salem -636 011 TamilNadu.
3. ICMR Sponsored Workshop on **Experimental animals Ethical Guidelines and Bio efficacy Studies for Biotechnological Application** Department of Biotechnology Karunya University Coimbatore January 9-10, 2013
4. National conference **"Recent trends in Bio prospecting of Plants"** Department of Plant science, Bharathidasan University, Tirucharappalli, during 28th and 29 th March2014
5. ISCA sponsored **National symposium on Innovations and advantages in science** &technology Pondicherry Center for Bioinformatics February 27 2014 (abs.noP-54)
6. 24th Annual conference of Indian association for angiosperm taxonomy (IAAT) and International conference on **Trends in Plants systematic (TIPS**) organized by Department of Plant science, Bharathidasan University, Tiruchirappalli, Tamilnadu, India and Oct 31 to November 2nd 2014
7. International conference on **Herbal Medicine and Neuroendocrinology** (InChMan). Organized by Department of Zoology, Annamalai University at October 13th 2014.
8. National Conference on **"Conservation, Characterization & Cultivation Of Medicinal Plants For Sustainable Utilization And Community Welfare."** Feb 23th & 25th Department of Botany, KM center, Pondicherry university, Salem - 636 011.

17. WHETHER ANY Ph.D. ENROLLED/PRODUCED OUT THE PROJECT:

YES - ENROLLED AND PRODUCED ONE Ph.D.

Name of the Candidate	Year of award	Title
P.PRAKASH	2017	Phytochemical Investigation and Pharmacological screening of *Decalepis hamiltonii* Wight & Arn

Acknowledgement

I sincerely thanks to the **UNIVERSITY GRANTS COMMISSION** for awarding this UGC-major research project "**Phytochemical Profiling, Bioactivity and *Invitro* Propagation of Endangered Medicinal Plant *Decalepis hamiltonii* Wight & Arn" UGC File No.** 42-969/2013 (SR) Dated: 14.03.2013. I would like to express my special gratitude and thanks to Annamalai University authorities and the **DEPARTMENT OF BOTANY** for giving me all the facilities needed to complete the project successfully.