Criterion - 7

Institutional Values and Best Practices

NAAC- SSR (2nd Cycle)

ETERNAL UNIVERSITY

BARU SAHIB, SIRMOUR-173101
HIMACHAL PRADESH

7.3.1(9)
Medicinal and aromatic plants wealth

ETERNAL UNIVERSITY
BARU SAHIB, SIRMOUR-173101
HIMACHAL PRADESH

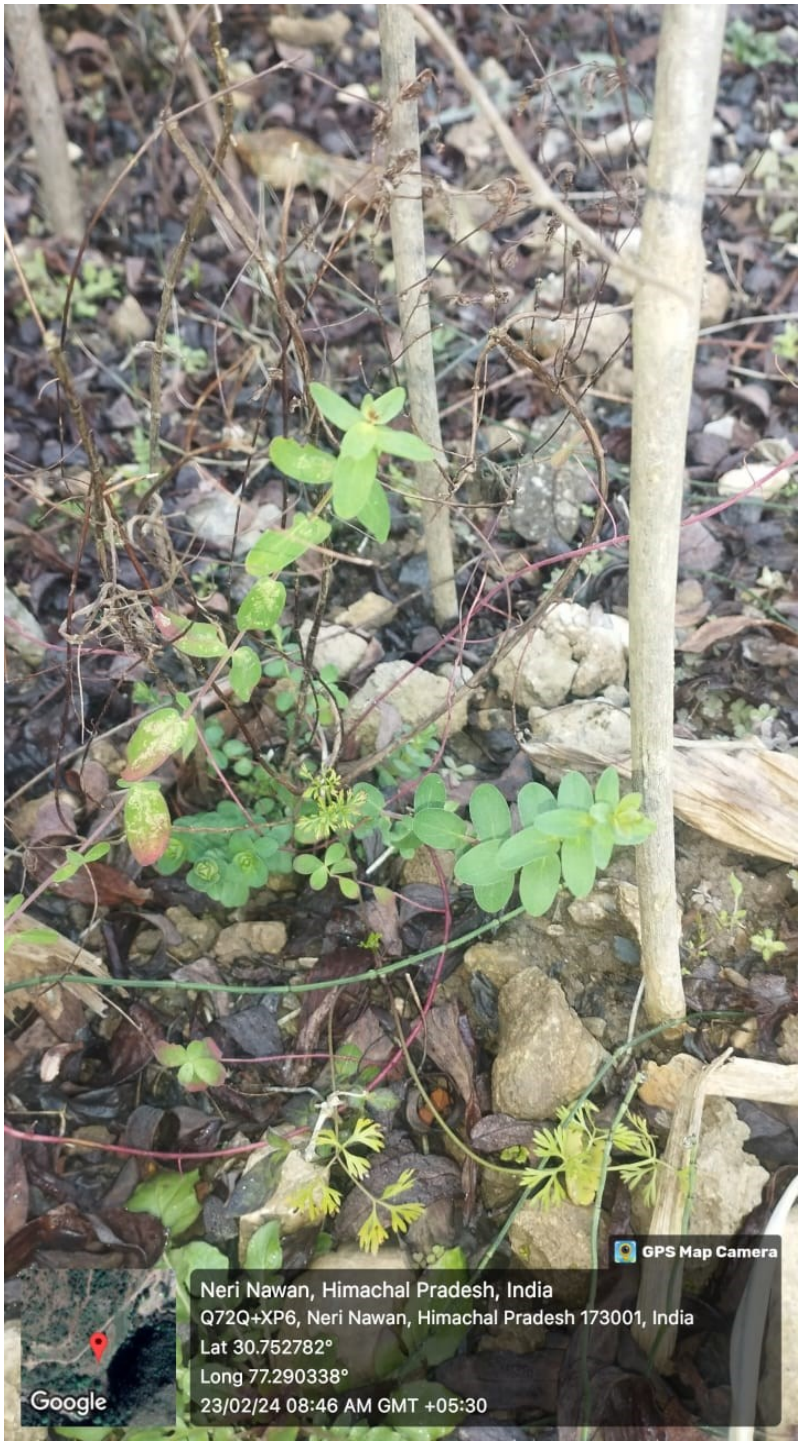
1. ***Roylea cinerea***


GPS Map Camera
Neri Nawan, Himachal Pradesh, India
Q72Q+XP6, Neri Nawan, Himachal Pradesh 173001, India
Lat 30.752829°
Long 77.290341°
23/02/24 08:47 AM GMT +05:30
Google

2. ***Aloe vera***

3. *Salvia rosmarinus*

4. *Thymus vulgaris*



5. ***Hypericum perforatum***

6. *Plantago ovata*

7. ***Celastrus paniculatus***


GPS Map Camera
Neri Nawan, Himachal Pradesh, India
Q72Q+XP6, Neri Nawan, Himachal Pradesh 173001, India
Lat 30.752539°
Long 77.290275°
23/02/24 08:41 AM GMT +05:30
Google

8. ***Iris sp.***

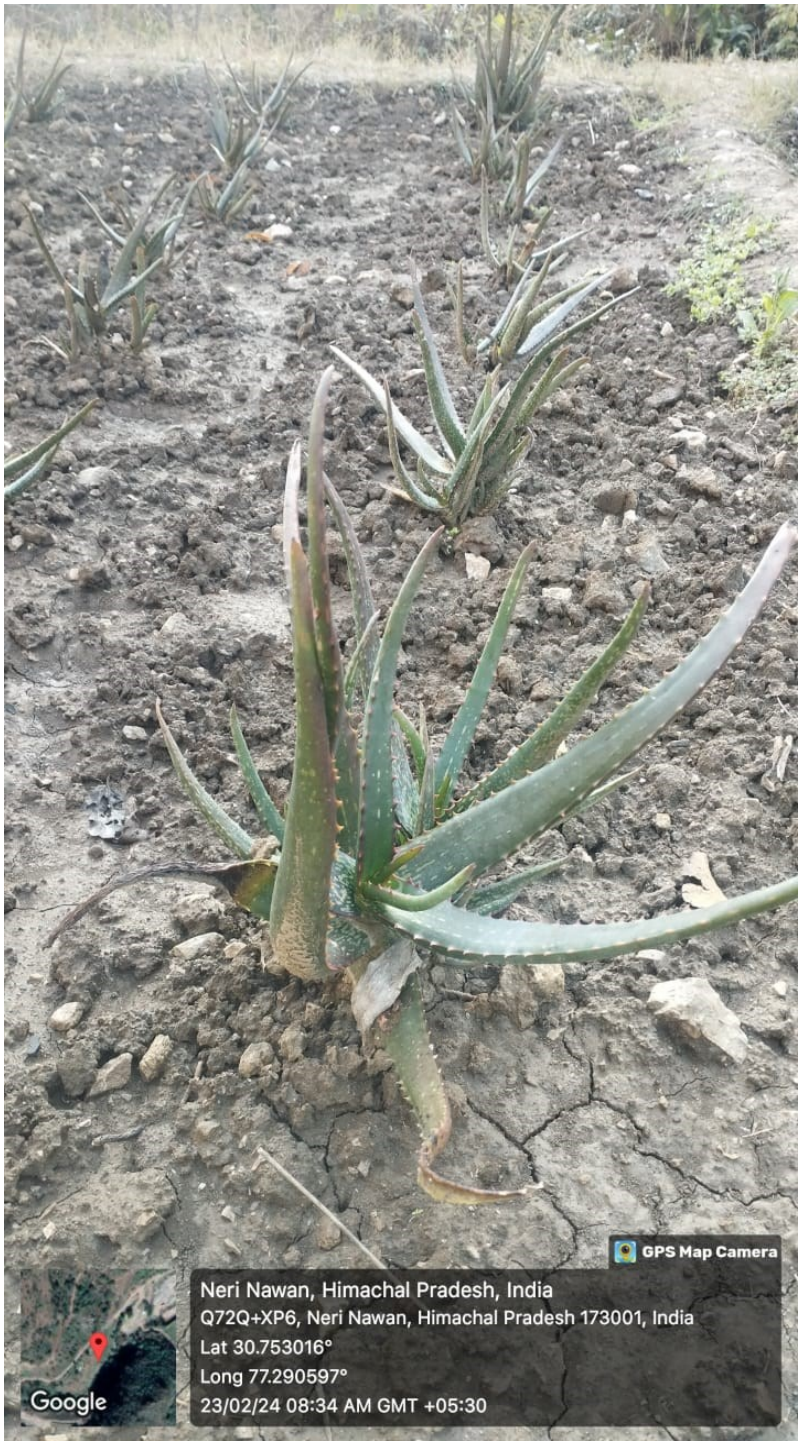
9. *Pogostemon benghalensis*

10. ***Bryophyllum pinnatum***

11. ***Solanum pseudocapsicum***

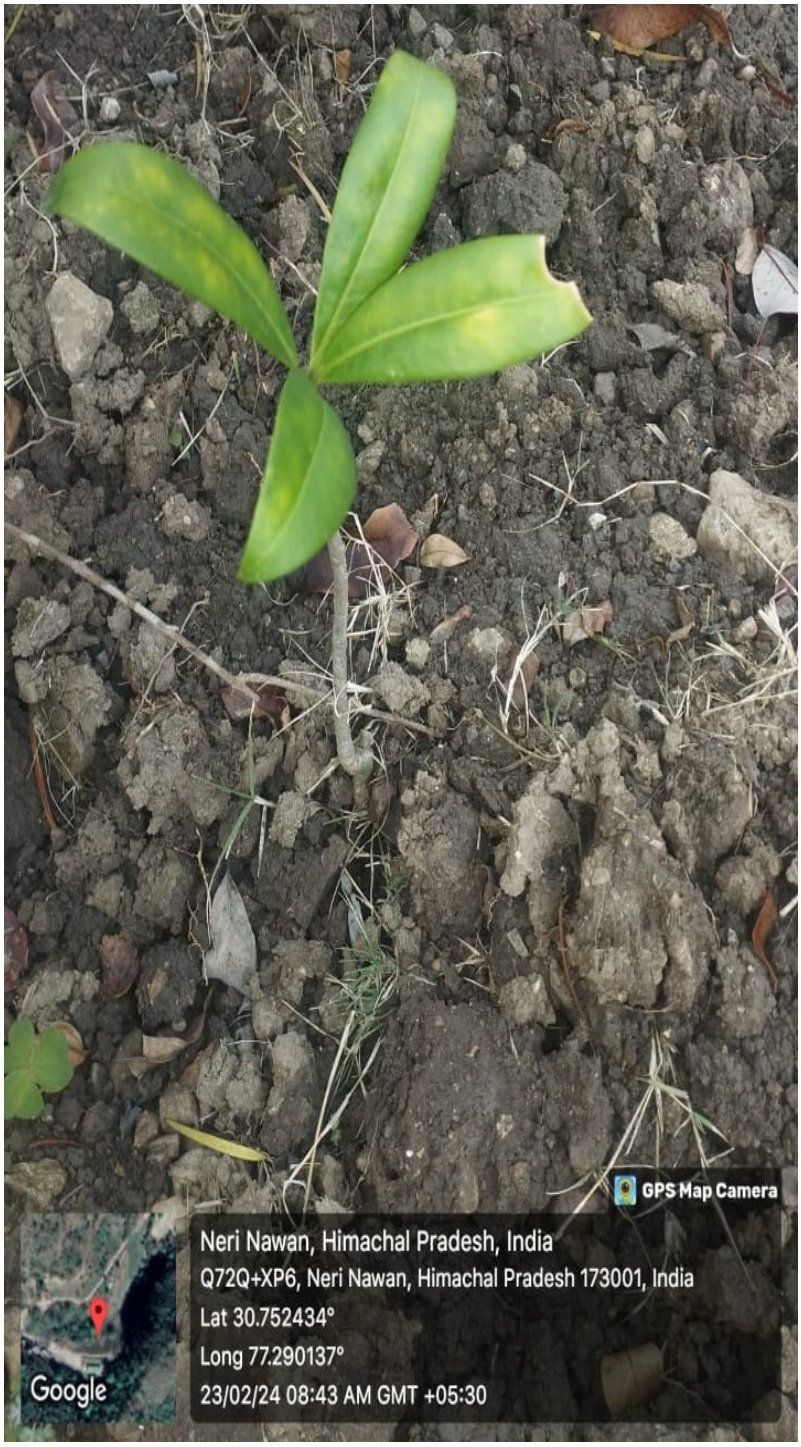
12. ***Chlorophytum borivilianum***

13. ***Achillea millefolium***


GPS Map Camera
Neri Nawan, Himachal Pradesh, India
Q72Q+XP6, Neri Nawan, Himachal Pradesh 173001, India
Lat 30.753016°
Long 77.290597°
23/02/24 08:34 AM GMT +05:30
Google

14. ***Aloe sp.***

15. ***Valeriana jatamansi***



16. ***Skimmia laureola***

(12) PATENT APPLICATION PUBLICATION

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(21) Application No.202111025665 A

(43) Publication Date : 17/03/2023

(54) Title of the invention : ANTI CANCER AND ANTI DIABETIC SYNERGISTIC COMPOSITION OF RASONT FROM BERBERIS SPECIES AND PROCESS THEREOF

(51) International classification	:A61K0036290000, A01H0005120000, C09B0061000000, C07C0403240000, B01D0053140000
(31) Priority Document No	:NA
(32) Priority Date	:NA
(33) Name of priority country	:NA
(86) International Application No	:NA
Filing Date	:NA
(87) International Publication No	: NA
(61) Patent of Addition to Application Number	:NA
Filing Date	:NA
(62) Divisional to Application Number	:NA
Filing Date	:NA

(71)**Name of Applicant :**

1)ETERNAL UNIVERSITY

Address of Applicant :VIA- RAJGARH, DISTT- SIRMOUR, BARU SAHIB, HIMACHAL PRADESH-173101, INDIA

CONTACT: 01799-276012 EMAIL: contact@eternaluniversity.edu.in Himachal Pradesh India

2)NATIONAL MEDICINAL PLANTS BOARD (NMPB)

(72)**Name of Inventor :**

1)SHARMA DR. VIVEK

2)SINGH DR. HARCHARAN DHALIWAL

3)SHARMA SHAGUN

(57) Abstract :

The present invention discloses an anti-cancer, anti-diabetic synergistic composition of "Rasont" from five species of Genus Berberis. This formulation is having anti-cancerous and anti-diabetic activity. The process and method used in the preparation of present formulation is quite simple and economic. Yield of Rasont is also quite high as compared to previous processes used for Rasont preparation. The process uses five species of genus Berberis i.e., Berberis aristata, Berberis chitria, Berberis vulgaris, Berberis lycium and Berberis pseudoumbellata. The process used in present invention is economic as no complex solvents are being used for the extraction and formulation, also the process is quite hygienic as compared to already existing methods.

No. of Pages : 26 No. of Claims : 2

EXPLORATION OF CYTOMORPHOLOGICAL, GENETIC AND PHYTOCHEMICAL, VARIABILITY IN DIFFERENT SPECIES OF GENUS *PHYSALIS* (L.)

THESIS

SUBMITTED IN PARTIAL FULFILMENT OF REQUIREMENTS FOR THE AWARD OF THE DEGREE OF

DOCTOR OF PHILOSOPHY
IN
BIOTECHNOLOGY

BY

NAVDEEP SHARMA
(BS13PSBT003)

DEPARTMENT OF BIOTECHNOLOGY
AKAL COLLEGE OF AGRICULTURE
ETERNAL UNIVERSITY

BARU SAHIB, HIMACHAL PRADESH-173101 (INDIA)
2018.

ETERNAL UNIVERSITY, BARU SAHIB

CERTIFICATE-I

CANDIDATE'S DECLARATION

I hereby certify that the work which is being presented in the thesis entitled **"Exploration of Cytomorphological, Genetic and Phytochemical Variability in Different Species of Genus *Physalis* (L.)"** in partial fulfilment of the requirements for the award of the degree of Doctor of Philosophy in Biotechnology and submitted in the Department of biotechnology, Akal College of Agriculture, Eternal University, Baru Sahib, Himachal Pradesh is an authentic record of my own research work carried out during the period from August, 2013 to July, 2018 under the supervision of **Dr. Vivek Sharma** and **Prof. H.S. Dhaliwal** at the Eternal University, Himachal Pradesh, India.

The contents presented in the thesis have not been submitted by me for the award of any other degree of this or any other institution.

Navdeep Sharma

(Navdeep Sharma)

This is to certify that the above statements made by **Mr. Navdeep Sharma (Regn. No. BS13PSBT003)** are correct to the best of our knowledge.

H.S. Dhaliwal

Dr. Prof. H. S. Dhaliwal
Co- Advisor

Dr. Vivek Sharma
Major Advisor

Date:

The Ph.D Viva-Voce Examination of **Mr. Navdeep Sharma** has been held on ....15.11.2018....

Signature
Major Advisor

Bikram Singh

Signature
External Examiner
Dr. Bikram Singh
Emeritus Scientist,
CSIR-IHBT, Palampur

ETERNAL UNIVERSITY, BARU SAHIB

CERTIFICATE-II

We, the undersigned, members of Research Degree Committee of **Mr. Navdeep Sharma** (Regn. No. BS13PSBT003), a candidate for the degree of **Doctor of Philosophy** in **Biotechnology,** agree that the thesis entitled **"Exploration of Cytomorphological, Genetic and Phytochemical Variability in Different Species of Genus *Physalis* (L.)"** may be submitted in the partial fulfilment of the requirements for the degree.

Dr. B.S. Sohal
Dean PGS/ Nominee

Dr. Vivek Sharma
Major Advisor
Associate Professor
Department of Botany

Dr. H. S. Dhaliwal
Co-Advisor
Professor
Department of Biotechnology

Dr. B. S. Boparai
Dean Akal College of Agriculture

Dr. Rahul Kumar
Associate Professor
Department of Biotechnology

Approved

Dr. B. S. Sohal
Dean Post Graduate Studies

Eternal University, Baru Sahib
Dated: 15/12/2018

ABSTRACT

Name: Navdeep Sharma **Reg. No.:** BS13PSBT003
Semester & Year of Admission: August, 2013. **Degree:** Ph.D.
Subject: Biotechnology **Specialization:** Biotechnology (Medicinal Plants)
Department: Biotechnology
Thesis Title: Exploration of Cytomorphological, Genetic and Phytochemical Variability in Different Species of Genus *Physalis* (L.)
Major Advisor: Dr. Vivek Sharma **Co-advisor:** Prof. H. S. Dhaliwal

Physalis (L.) is the fifth largest genus of the family Solanaceae including more than hundred pharmaceutically important species. The present study is an effort to explore the cytomorphological, phytochemical and genetic variability in five different species of genus *Physalis* (L.) *viz., P. angulata* (L.), *P. ixocarpa* Brot ex Hornem., *P. longifolia* Nutt., *P. minima* (L.) and *P. peruviana* (L.) collected from different regions of Northern India. Cytomorphological studies revealed the variation only in the chromosome numbers of *P. minima* (L.) showing cytotypes with 2n=2x=24 and 2n=4x=48 chromosome number. Five species of genus *Physalis* (L.) were screened out with Liquid chromatography Mass Spectrometery for characterization of phytochemicals. Out of all these species, *P. angulata* (L.) was found to be the best species for isolation of phytochemicals. The ethyl acetate extract was subjected to column chromatography over silica gel and three bioactive components were isolated *viz.,* Physalin-F, Physalin-D and Physapubenolide. The structures of isolated compounds were characterized with the help of 1D and 2D NMR including DEPT, HMQC, HMBC and 1H-1HCOSY spectroscopy as well as ESI-QTOF-MS/MS analysis. The isolated bioactive components, polyphenols and vitamins were quantified in leaves and fruits of the investigated species using RP-HPLC-PDA system. The GC-MS analysis of methanolic leaves and fruit extracts showed higher concentration of hexadecanoic acid in *P. longifolia* Nutt leaves and fruits. All the species were also explored for their anti-oxidant, anti-microbial and cytotoxic potential. The observations concluded the effectiveness of both methanolic and aqueous extracts but leaves extracts of *P. minima* (L.) (2x) were found to be more effective against free radical scavenging activity. Physapubenolide was found more cytotoxic against the cell lines *viz.,* A549 (human lung carcinoma), Cal-27 (human squamous carcinoma) and SiHa (human cervical cancer). All these species were also screened out for their genetic diversity employing InDel and COS markers. On the basis of various activities and ethnobotanical uses, a new polyherbal formulation was also prepared by combining pharmacological active herbs. The formulated product was also qualitatively and quantitatively investigated for polyphenols, vitamins and bioactive constituents using RP-HPLC-PDA. The polyherbal product showed a very decent cytotoxic effect against the selected cell lines. These results concluded the effectiveness of formulated polyherbal product as a nutritious and bioactive food supplement.

Navdeep Sharma

Navdeep Sharma

CYTOMORPHOLOGICAL, PHYTOCHEMICAL, BIOACTIVITIES AND BIOMOLECULAR EVALUATIONS OF GERMPLASM OF *WITHANIA SOMNIFERA* (L.) DUNAL AND *TINOSPORA CORDIFOLIA* MIERS EX HOOK F. & THOMS FROM NORTH-WEST INDIA

THESIS

SUBMITTED IN PARTIAL FULFILMENT OF REQUIREMENTS FOR THE AWARD OF THE DEGREE OF

DOCTOR OF PHILOSOPHY
IN
BIOTECHNOLOGY

BY

ANISHA BANO
(BS13PSBT002)

DEPARTMENT OF BIOTECHNOLOGY
AKAL COLLEGE OF AGRICULTURE
ETERNAL UNIVERSITY
BARU SAHIB, HIMACHAL PRADESH-173101
DECEMBER, 2018

ETERNAL UNIVERSITY, BARU SAHIB

CERTIFICATE-I

CANDIDATE'S DECLARATION

I hereby certify that the work which is being presented in the thesis entitled **"Cytomorphological, Phytochemical, Bioactivities and Biomolecular Evaluations of Germplasm of *Withania somnifera* (L.) Dunal and *Tinospora cordifolia* Miers Ex Hook F. & Thoms from North-West India"** in partial fulfilment of the requirements for the award of the degree of Doctor of Philosophy in Biotechnology and submitted in the Department of Biotechnology, Akal College of Agriculture, Eternal University, Baru Sahib, Himachal Pradesh is an authentic record of my own research work carried out during the period from August, 2013 to December, 2018 under the supervision of **Dr. Vivek Sharma** and **Dr. H.S. Dhaliwal** at the Eternal University, Himachal Pradesh, India.

The contents presented in the thesis have not been submitted by me for the award of any other degree of this or any other institution.

Anisha Bano

(Anisha Bano)

This is to certify that the above statements made by **Ms. Anisha Bano (Reg. No. BS13PSBT002)** are correct to the best of our knowledge.

H.S. Dhaliwal

Dr. H.S. Dhaliwal

Co-Advisor

Dr. Vivek Sharma

Major Advisor

Date:

The Ph.D. Viva-Voce Examination of **Ms. Anisha Bano** has been held on 11.05.2019

Signature

Major Advisor

Signature

External Examiner

Dr. R.C. Gupta
Professor
Dept. of Botany
Punjabi University, Patiala

ETERNAL UNIVERSITY, BARU SAHIB

CERTIFICATE-II

We, the undersigned, members of Research Degree Committee of **Ms. Anisha Bano** (Reg. No. BS13PSBT002), a candidate for the degree of **Doctor of Philosophy in Biotechnology,** agree that the thesis entitled **"Cytomorphological, Phytochemical, Bioactivities and Biomolecular Evaluations of Germplasm of *Withania somnifera* (L.) Dunal and *Tinospora cordifolia* Miers Ex Hook F. & Thoms from North-West India"** may be submitted in the partial fulfilment of the requirements for the degree.

Dean PGS/Nominee

Dr. Vivek Sharma
Major Advisor
Associate Professor
Department of Botany

Dr. H.S. Dhaliwal
Co-Advisor
Professor
Department of Biotechnology

Dr. B.S. Boparai
Dean Akal College of Agriculture

Dr. Rahul Kumar
Associate Professor
Department of Genetics and Plant Breeding

Approved

Dr. B.S. Sohal
Dean Post Graduate Studies

Eternal University, Baru Sahib
Dated: 11.05.2019

ABSTRACT

Name: Anisha Bano **Reg. No.:** BS13PSBT002

Semester & Year of Admission: August, 2013 **Degree:** Ph.D.

Subject: Biotechnology **Specialization**: Biotechnology (Medicinal Plants)

Department: Biotechnology

Thesis Title: Cytomorphological, Phytochemical, Bioactivities and Biomolecular Evaluations of Germplasm of *Withania somnifera* (L.) Dunal and *Tinospora cordifolia* Miers Ex Hook F. & Thoms from North-West India.

Major Advisor: Dr. Vivek Sharma **Co-advisor:** Dr. H.S. Dhaliwal

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Tinospora cordifolia (Willd.) Miers ex Hook. F. & Thoms (Menispermaceae) and *Withania somnifera* (L.) Dunal (Solanaceae) are the two most versatile plants of Indian Pharmacopoeia and also important components of many polyherbal formulations. The present study is an attempt to explore the cytomorphological variations and their impact on metabolic profile and bioactivities potential of these plants which play an important role in upregulation and quality improvement of herbal products. The cytomorphological study of these plants has revealed the dioecious nature of *T. cordifolia* and presence of two morphotypes of *W. somnifera* (Red fruit morphotype and yellow fruit morphotype). The impact of dioecy and morphological variations on metabolic profile was studied by various analytical techniques like GC-MS, HPLC, MS and NMR. The GC-MS analysis has clearly suggested variation in quantities of identified compounds in male and female stems of *T. cordifolia* and morphotypes of *W. somnifera* (leaves and roots). The HPLC analysis of major secondary metabolites has revealed the higher quantities of berberine, magnoflorine and palmatine in male stem of *T. cordifolia* while withaferin-A and withanolide-A in leaves of red fruit morphotype of *W. somnifera*. Even the quantities of the most studied polyphenols were also higher in male stem of *T. cordifolia* and leaves of red fruit morphotype of *W. somnifera*. The estimation of vitamins (B-vitamins and vitamin-C) has also showed a great variation in their contents with higher quantities in female stem (*T. cordifolia*) and leaves of red fruit morphotype (*W. somnifera*). Further, chemical characterization has showed the presence of magnoflorine, tinocordifolin and 11-hydroxymustakone in *T. cordifolia* and withaferin-A isomer, coagulin-Q and feruloyltramine in *W. somnifera*. The plants have also been explored for bioactivities potential on the basis of their dioecy and

morphological variations. The male stem of *T. cordifolia* and leaves of red fruit morphotype of *W. somnifera* showed the best anti-oxidant and anti-microbial potential. While, study of their cytotoxicity against HepG2 cell line has revealed highest cytotoxic effect of leaves of red fruit morphotypes as compare to all the evaluated materials. So, the species was also studied for its genetic diversity. After identification of best germplasm of both the species (male stem of *T. cordifolia* and leaves of red fruit morphotype of *W. somnifera*) from their metabolic profile and bioactivities potential, a polyherbal formulation was prepared. The HPLC and IC-PMS analysis of the herbal formulation has showed a significant quantities of polyphenols, vitamins and mineral elements. The product was also found to be cytotoxic against HepG2 cells which suggests this formulation could be an effective medicinal and nutritional supplement.

Anisha Bano

Anisha Bano