Annexure – XI

UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI – 110 002
PROFORMA FOR SUBMISSION OF INFORMATION AT THE TIME OF SENDING THE FINAL REPORT OF THE WORK DONE ON THE PROJECT

1. Title of the Project: Genetic diversity, *in vitro* propagation, molecular characterization and conversation of *Meconopsis* species in Kashmir Himalaya.

2. NAME AND ADDRESS OF THE PRINCIPAL INVESTIGATOR: Professor Zahoor Ahmad Kaloo Department of Botany, University of Kashmir, Srinagar-190006. E-mail: zakallu@yahoo.com

3. NAME AND ADDRESS OF THE INSTITUTION: Department of Botany, University of Kashmir, Hazratbal, Srinagar-190006.

4. UGC APPROVAL LETTER NO. AND DATE: F. No. 43-138/2014(SR)

5. DATE OF IMPLEMENTATION: 15-01-2016

6. TENURE OF THE PROJECT: 3 YEARS

7. TOTAL GRANT ALLOCATED: 14, 30,000/=

8. TOTAL GRANT RECEIVED: 12, 68,257/=

9. FINAL EXPENDITURE: (Copy enclosed)

10. TITLE OF THE PROJECT: Genetic diversity, *in vitro* propagation, molecular characterization and conversation of *Meconopsis* species in Kashmir Himalaya.

11. OBJECTIVES OF THE PROJECT:
a) To identify and collect the selected plant species from their natural habitat.**b)** To standardize *ex situ* protocols for their large scale propagation and conservation.**c)** To study the genetic diversity using molecular markers.

12. WHETHER OBJECTIVES WERE ACHIEVED: YES
(Detailed project report attached)

13. ACHIEVEMENTS FROM THE PROJECT:
- Ex situ conservation protocols in the form of Micropropagation and the production of synthetic seeds were established for large scale propagation and sustainable utilization of the planting material amenable for cultivation to the farmers.
- About 20 post graduate trainees, 2 M.Phil students and 3 Ph.D scholars were benefited from the said project.
- The said project significantly helped in the establishment of Lab.

14. SUMMARY OF THE FINDINGS:

Kashmir Himalaya harbors a rich diversity of medicinal and aromatic plants. These plants are a rich repository of active secondary metabolites exploited for wider range of medicinal activities against various ailments. *Meconopsis aculeta* Royle. (Papaveraceae) commonly known as blue poppy is one such plant facing propagation problems on account of its intermittent distribution. The rare distribution and low density of species with great anthropogenic pressure, may gradually lead to extinction in absence of any conservation action programme. Against this back drop, current project encompasses on the studies of *in vitro* techniques for conservation amenable for cultivation to local marginal farmers. Tissue culture techniques such as *in vitro* propagation, somatic embryogenesis and synthetic seed technology used in current project may serve as an important means of conservation. Tissue culture techniques proved a fast and a recurrent source for the production of a large quantity of uniform planting material in a short time period. The collected plants were characterized for phytochemical analysis using different chromatographic techniques. Wild and tissue culture raised plants were compared through phytochemical profiling to determine the constituents with some medicinal use. Tissue culture raised plants proved to be superior to wild plants in terms of phyochemicals and health promiting components. Shoot regeneration was achieved from the seed explants when cultured on MS medium supplemented with different concentrations of growth adjuvants. MS medium supplemented with Zeatin (2mg/l) + NAA (0.1mg/l) proved best medium for the shoot regeneration, on which shoots with mean length of (3.45± 0. 52 cm) produced within 28 days with culture response of 40%. The *in vitro* regenerated shoots produced roots when transferred on MS medium supplemented with different concentration and combinations of PGR's. On MS medium augmented with Zeatin (2mg/l) + IAA (1mg/l), 14.65 ± 1.23 mean number of roots were produced with mean length of 3.20 ± 0.20 cm within 42 days and was found to be the best medium in terms of number of roots and number of days taken for root regeneration. Shoot tip explants cultured on MS medium containing different concentrations of auxins and cytokinins initiated callus formation after 30 days. However, the best callus production response was achieved on MS + Kn (3.5 mg/l) + NAA (1.0 mg/l) on which highest frequency of callus production was achieved in 80% cultures. The highest embryogenic callus induction percentage of 80 % was achieved on MS medium supplemented with NAA (1.5 mg/l) + BAP (0.5 mg/l). The embryogenic callus maintained on MS medium was later encapsulated to be converted into

synthetic seeds. The maximum conservation frequency of (54.50 ± 1.10%) was observed, when the embryogenic callus was encapsulated with 2.5% sodium alginate. The genetic diversity among different populations of *Meconoposis latifolia* was performed by RAPD analysis. The scoring of RAPD profile generated by OPE-14 primer amplified a maximum of 13 fragments. The DNA barcoding was performed by using ITS (ITS5A and ITS4) and RBCL Primers (RBCL1f, RBCL72r) and sequencing of a fragment of 341bp and 356bp was achieved respectively.

15. CONTRIBUTION TO THE SOCIETY:
Apart from direct benefit to the students and scholars from the project, the scientific expertise gained through the establishment of *ex-situ* conservation protocols can directly benefit to the marginal farmers of Kashmir Himalaya to earn their livelihood.

16. WHETHER ANY PH.D. PRODUCED OUT OF THE PROJECT: 01

17. NO. OF PUBLICATIONS OUT OF THE PROJECT: 01

(PRINCIPAL INVESTIGATOR)

Principal Investigator
Department of Botany
University of Kashmir

(REGISTRAR/PRINCIPAL)
(Seal)

Dean Research
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