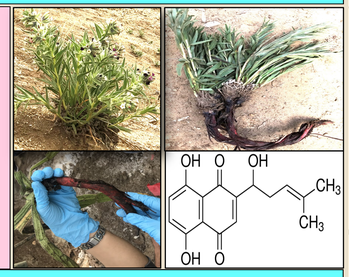
# *Arnebia euchroma* leaf induced *in vitro* adventitious roots: an alternate source of naphthoquinones


**Jyoti Devi[1,3] , Dinesh Kumar[2,3] and Shashi Bhushan[1,3,4*]**

[1]Biotechnology Division, CSIR-Institute of Himalayan Bioresource Technology (IHBT), Palampur, H.P.-176061, India
[2]Chemical technology Division, CSIR-Institute of Himalayan Bioresource Technology (IHBT), Palampur, H.P.-176061, India
[3]Academy of Scientific and Innovative Research (AcSIR), Ghaziabad-201002, India
[4]Food and Nutraceutical Division, CSIR-Institute of Himalayan Bioresource Technology (IHBT), Palampur, H.P.-176061, India *Corresponding author email: sbhushan@ihbt.res.in


## INTRODUCTION

*Arnebia euchroma* is a high value herbaceous perennial plant distributed in the alpine region of Himalayas. It belongs to family Boraginaceae. The roots of plant contains naphthoquinone pigments that are used as colorant and have numerous pharmaceuticals properties such as anti-microbial, anti-cancer, antipyretic and anti-inflammatory. There is huge demand of these natural pigments and are collected from the wild. Overexploitation of natural habitat has led to reduction in its population and therefore listed as critically endangered plant species. In this regard, plant cell and tissue culture technology could be useful as an alternate system to produce such pigments.



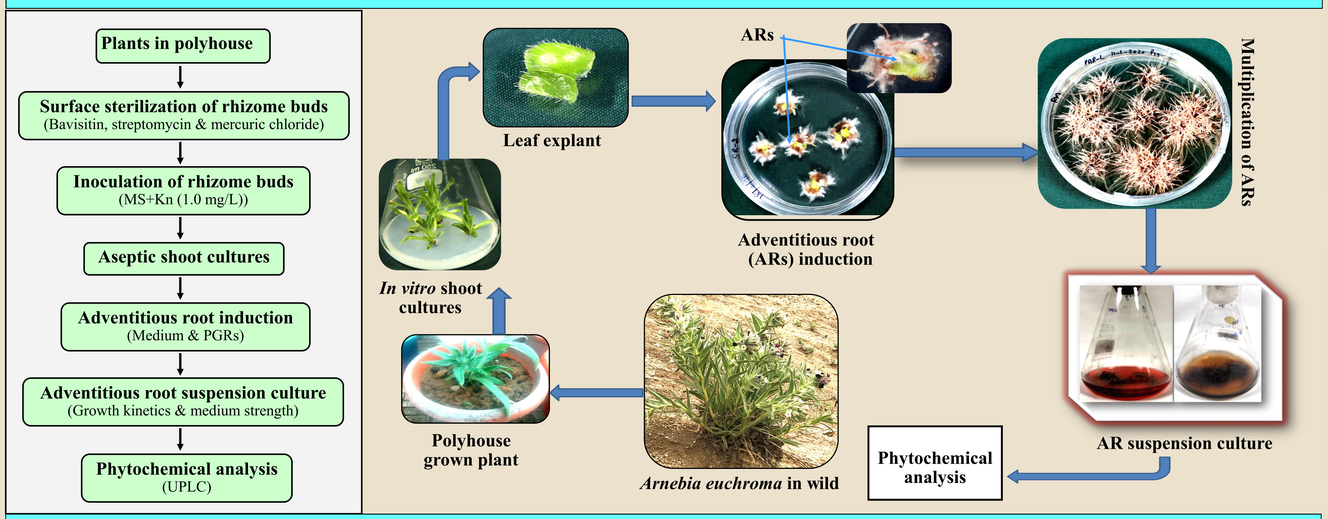

## RATIONAL OF STUDY

. Critically endangered status
. Difficult to propagate
. Noticeable yield of naphthoquinones found in 3-4 years old plant
. Gap in demand and supply

**Aim: To develop an alternate system for naphthoquinone pigment production on sustainable basis**

Adventitious roots grown from aerial parts of plant (leaf, hypocotyl, stem and non-root tissue of old roots) are found to have phytochemical production capacity with shorter period of time. Until now there is no successful production of naphthoquinones from adventitious roots of *Arnebia euchroma*

## METHODOLOGY




## CONCLUSION

Adventitious roots can be a good alternative system for the production of metabolites on sustainable basis

## RESULTS

. Adventitious roots were induced from leaf explant in MS medium supplemented with IBA (3.0 mg/L) (Fig.1).
. Four weeks is suitable culture period for the cultivation of adventitious roots in liquid medium (Fig.2).
. Full strength (1x) MS medium found to be optimum for the production metabolites from adventitious root culture of adventitious roots (Fig.3).
. Adventitious roots found to have 4122.31 µg.g$^{-1}$ DW metabolite content after 4 weeks of cultivation as compared to 5563.34 µg.g$^{-1}$ DW in plant rhizome after 3-4 years of cultivation.

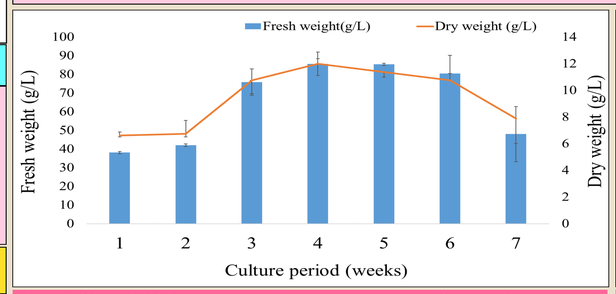



**Fig.1. Effect of PGRs on adventitious root induction from leaf explant of *Arnebia euchroma***

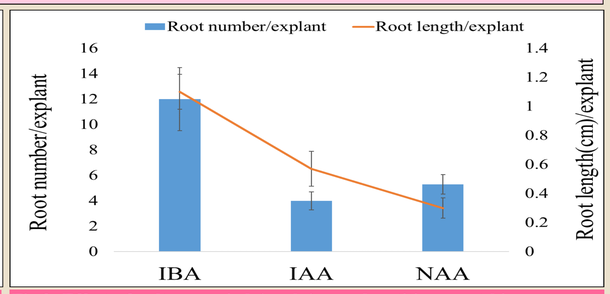



**Fig.2. Effect of culture period (weeks) on adventitious root biomass accumulation**

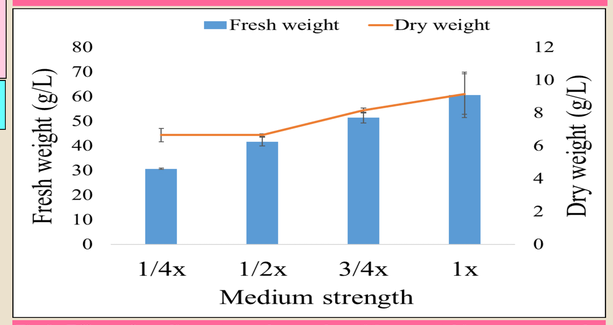



**Fig.3. Effect of medium strength on adventitious root biomass accumulation**

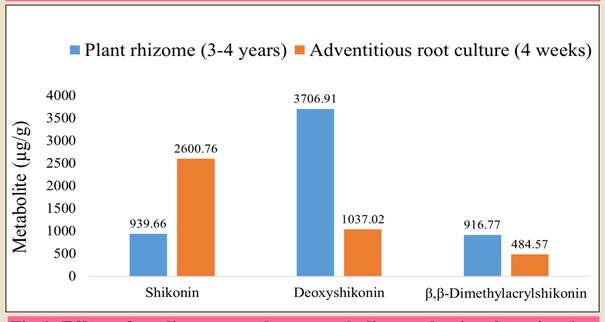



**Fig.4. Effect of medium strength on metabolite production from in *vitro* adventitious root cultures**

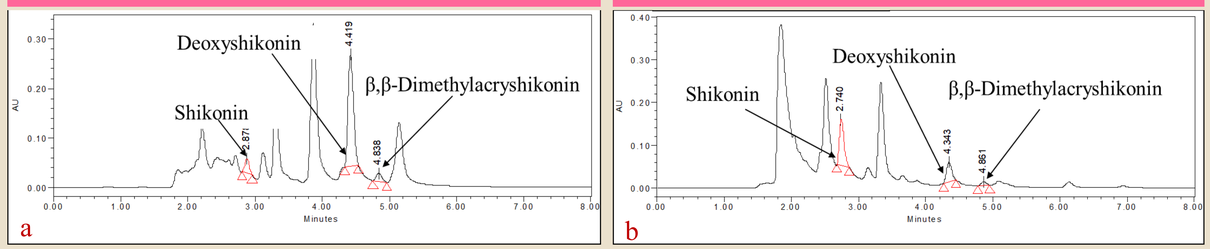



**Fig.5. Chromatogram showing metabolites from (a) plant rhizome and (b) adventitious root culture**

## ACKNOWLEDGEMENT


Author's are thankful to CSIR, New Delhi, Government of India and AcSIR, New Delhi for providing the necessary support to carry out this research work