

Diversity of Underground Medicinal and Aromatic Plants and their Regeneration for Further *Ex situ* Conservation in Herbal Garden

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Abstract

Plants include a variety of useful substances for human beings and are widely used for treatment of various disorders. Plants are propagated mostly by their seeds but stem cutting also found to be useful for this purpose. Except of above methods some plants are also propagating through their modified root or stem found commonly inside of the soil or underground part of the plant. Some examples are Rhizome, Bulb, Tuber, corm etc. These structures are modified form and useful to regenerate the plants in favorable environmental condition. During of adverse condition these are found in resting phase and when moisture level increase new buds are produced by nodular part of them which performing efficient capability to reproducing the new plants as their parental ones. 42 Medicinal and aromatic plants underground parts were collected in different part of the Chhattisgarh and propagated in Herbal Garden in poly bags and also direct in the prepared beds. Developed new individuals of these plants in poly bags were carefully shifted to the prepared field for their further growth and development. As per need of the newly developing plants necessary facilities were provided.

Keywords: *Ex situ* conservation; Diversity; Medicinal and aromatic plants; Underground parts; Herbal Garden

Introduction

Plants are valuable components of the global biodiversity. Among a large group of the plants many plants are significantly performing their applicability in multifold utility for human beings. These are a major source of the food, fodder, fuel and also categorized for the use as medicine these group of the plants are referred as a Medicinal and Aromatic Plants.

Diversity, presence, mode of utilization, propagation modes etc. are differs from plants species to species. It is directly or indirectly affected by various factors like local environmental condition, Available facilities required for the growth and development of the plants as well as their genetic makeup.

Various plant parts like root, stem, and leaf are useful for specific purpose such as for medicinal value or for propagation. Modified plant parts like Bulb, Tuber, Rhizome, Corm etc. are also registered as useful plant parts for certain species. These structures are found to be useful for propagation as alternative source of the seeds and used for medicinal values. Mode of their utilization is variable.

Day by day due to climatic changes, increasing population load, over exploitation etc. are becoming major reasons for loss of the species in different habitat. Valuable plant parts which located inside of the soil are referred as Underground plants. These are mostly regenerated by their modified underground structures like Bulb, Tuber, Rhizome, Corm etc.

Some Medicinal and Aromatic plants are propagating by both the modes like by seeds as well as by underground plant parts like *Asparagus racemosus*. So in current scenario there is an urgent need for their assessment, regeneration and conservation for future generation.

Present study focuses on the collection/Propagation of the diverse underground Medicinal and Aromatic plants. Among the introduced Underground Medicinal and Aromatic plants some are endangered need for much care and conservation.

Ethno-medicinal Study/Use of medicinal plants of these plants were made by Abhyankar and Upadhyay [1], Agarwal [2], Sharma and

Kumar [3], Wagh and Jain [4], Swarnakar and Katewa [5], Savithamma et al. [6], Jyothi et al. [7], Shajeela et al. [8], Sheikh et al. [9], Sujatha and Renuga [10].

Documentation of Wild tuberous plants was carried out by Prashanth and Shiddamallayya [11]. Conservation strategy for *Gloriosa superba* Linn was made by Singh et al. [12] whereas conservation of highly exploited medicinal plants of Vindhyam range (U.P.) studied by Singh et al. [13]. Conservation and cultivation of threatened and high valued medicinal plants in north East India carried out by Shankar and Rawat [14]. Review on a tuberous, endangered medicinal plant was done by Ade and Rai [15].

Materials and Methods

Underground plant parts like Bulb, Tuber, Rhizome, Corms were collected / removed from soil and carried out in Herbal Garden for their further regeneration. Underground plant parts were collected and shade dry was applied for their storage and for control on bud/root initiation. When it gets favorable environmental condition it starts their growth.

Above parts were primarily initiated the origination of new buds/roots for this purpose these are put in cotton/jute clothes with proper water management. After initiation of the new buds of the underground parts were selected for further development. Each part of the underground parts used for this purpose selected by the presence of one, two buds and are carefully removed from the mother plants. These plant parts were deep in soil in moderate depth than cover by using

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soil mixing with sand and manure. Light irrigation applied in planted these plant parts.

As per need of the Medicinal and Aromatic Plants water, nutrient etc. were provided and protected the plant against diseases, insect pest etc. effect. Excess water removal facility was also carried out for protection of these structures against its decay.

Results and Discussion

Collected varied underground plant parts were stored in shade and dry places in summer season and during of starting of rains these are

applied for development of new buds which are efficient to develop into new individuals as their parental ones.

Results of the current research is shown in Table 1 that includes each plants Common name, Botanical names, Family, Habit, Propagation and mode of multiplication. Table 2 is for distribution of the Medicinal and Aromatic plants according to their families individually. Maximum members of the family *Liliaceae* 13 plant species were propagated, secondly 09 species of the family *Zingiberaceae* was propagated by Rhizomes. Rests of the plants belonging to listed families were propagated 01- 04 plant species separately.

S. No.	Common Name	Botanical Name	Family	Habit	Propagation	Mode of Multiplication
1	Adarak/Zinger	<i>Zinziber officinale</i> Rose.	Zingiberaceae	Herb	Rhizome	Poly Bags
2	Air Potato	<i>Dioscoria bulbifera</i> Linn.	Dioscoriaceae	Herb/Climber	Tuber	Poly Bags
3	Ama Adarak, Mango ginger	<i>Curcuma amada</i> Roxb.	Zingiberaceae	Herb	Rhizome	Poly Bags
4	Banana	<i>Musa paradica</i> Linn.	Musaceae	Herb	Rhizome	Field
5	Beet	<i>Beta vulgaris</i> L.	Amaranthaceae	Herb	Seed	Field
6	Black Turmeric	<i>Curcuma caesia</i> Roxb.	Zingiberaceae	Herb	Rhizome	Poly Bags
7	Blue ginger	<i>Alpinia galanga</i> (L.) Willd.	Zingiberaceae	Herb	Rhizome	Poly Bags
8	Canna	<i>Canna indica</i> Linn.	Zingiberaceae	Herb	Rhizome	Poly Bags
9	Canyon morning-glory	<i>Ipomoea barbatisejala</i> A. Gray.	Convolvulaceae	Herb	Tuber/Stem cutting	Field
10	Cylindrical Snake Plant	<i>Sensiveria cylindrica</i> Bojer.	Agavaceae	Herb	Rhizome	Poly Bags
11	Easter lily	<i>Hippeastrum puniceum</i> (Lam.) Voss.	Amaryllidaceae	Herb	Bulb	Field
12	Football lily	<i>Scadoxus multiflorus</i> (Marty) Raf.	Liliaceae	Herb	Bulb	Field
13	Four o' clock plant	<i>Mirabilis jalapa</i> Linn.	Nyctaginaceae	Herb	Seed/ Stem cutting/Tuber	Poly Bags
14	Garlic	<i>Allium sativum</i> Linn.	Liliaceae	Herb	Bulb	Poly Bags
15	Gulbacauli	<i>Hedychium coronarium</i> J. Koenig	Zingiberaceae	Herb	Rhizome	Field
16	Haldi	<i>Curcuma longa</i> Linn.	Zingiberaceae	Herb	Rhizome	Poly Bags
17	Kali Musli	<i>Curculigo orchioides</i> Gaerth.	Hypoxidaceae	Herb	Rhizome	Poly Bags
18	Kalihari, Glory Lili	<i>Gloriosa superba</i> Linn.	Liliaceae	Herb	Tuber	Poly Bags
19	Keukand	<i>Costus speciosus</i> (J. Konig) Sm.	Liliaceae	Herb	Rhizome	Poly Bags
20	Muli	<i>Raphanus sativus</i> L.	Brassicaceae	Herb	Seed	Field
21	Nagarmotha	<i>Cyperus rotundus</i> Linn.	Cyperaceae	Herb	Rhizome	Field
22	Onion	<i>Allium cepa</i> Linn.	Liliaceae	Herb	Bulb	Poly Bags
23	Pink rain lily	<i>Zephyranthes rosea</i> Lindl.	Amaryllidaceae	Herb	Bulb	Poly Bags
24	Rajnigandha	<i>Polyanthus tuberosa</i> Linn.	Amaryllidaceae	Herb	Tuber	Poly Bags
25	Ram dauton	<i>Smilax Chinensis</i> Linn.	Smilacaceae	Shrub	Rhizome	Field
26	Safed Musli	<i>Chlorophytum borivilianum</i> San. & Fer.	Liliaceae	Herb	Bulb	Field
27	Safed Musli	<i>Chlorophytum borivillionam</i> San. & Fer.	Liliaceae	Herb	Rhizome	Poly Bags
28	Satavar	<i>Asparagus racemosus</i> Willd.	Liliaceae	Herb/Climber	Seed/Tuber	Poly Bags
29	Sisal Hemp	<i>Agave sesalana</i> Perr.	Agavaceae	Shrub	Rhizome	Poly Bags
30	Small Arbi	<i>Colocasia esculenta</i> (L) Schott	Araceae	Herb	Corn	Poly Bags
31	Snake Plant	<i>Sensiveria trifaciata</i> Prain.	Agavaceae	Herb	Rhizome	Poly Bags
32	Spider lily	<i>Crinum latifolium</i> Linn.	Liliaceae	Herb	Bulb	Field
33	Sudarshan	<i>Crinum latifolium</i> Linn.	Liliaceae	Herb	Bulb	Poly Bags
34	Sudersan	<i>Linnium usitatissium</i> Linn.	Liliaceae	Herb	Bulb	Poly Bags
35	Sweet flag	<i>Acorus calamus</i> Linn.	Araceae	Herb	Rhizome	Poly Bags
36	Sweet potato	<i>Ipomoea batatas</i> Linn.	Convolvulaceae	Herb	Tuber/Stem cutting	Field
37	Tikhur	<i>Curcuma angustifolia</i> .	Zingiberaceae	Herb	Rhizome	Poly Bags
38	Wild Onion	<i>Allium canadense</i> Linn.	Liliaceae	Herb	Bulb	Poly Bags
39	Wild garlic	<i>Allium vineale</i> Linn.	Liliaceae	Herb	Bulb	Poly Bags
40	Wild Zinger	<i>Curcuma aromtica</i> Linn.	Zinziberaceae	Herb	Rhizome	Field
41	Zimi kand	<i>Amorphophallus dubius</i> Linn.	Araceae	Herb	Corn	Poly Bags
42	Zimikand	<i>Amorphophallus paeoniifolius</i> (Dennst.) Nicolson	Araceae	Herb	Corn	Field

Table 1: Underground medicinal and aromatic plants (MAPs) and their regeneration in herbal garden.

S. No.	Family	Herb	Shrub	Tree	Total
1	Agavaceae	+, +	+	-	3
2	Amaranthaceae	+	-	-	1
3	Amaryllidaceae	+, ++	-	-	3
4	Araceae	+, ++, +	-	-	4
5	Brassicaceae	+	-	-	1
6	Convolvulaceae	+, +	-	-	2
7	Cyperaceae	+	-	-	1
8	Dioscoriaceae	+	-	-	1
9	Hypoxidaceae	+	-	-	1
10	Liliaceae	+, ++, ++, ++, ++, ++, ++, ++, ++	-	-	13
11	Musaceae	+	-	-	1
12	Nyctaginaceae	+	-	-	1
13	Smilacaceae	-	+	-	1
14	Zingiberaceae	+, ++, ++, ++, ++, ++, ++	-	-	9
TOTAL					42

Table 2: Family wise distribution of aromatic plants.

S. No.	Mode of Multiplication	Number
1	Bulb	11
2	Corm	3
3	Rhizome	19
4	Seed	2
5	Seed/Tuber	1
6	Seed/ Stem cutting/Tuber	1
7	Tuber/Stem cutting	2
8	Tuber	3
Total		42

Table 3: Multiplication methods of MAPs.

S. No.	Habit Type	Number of the Aromatic Plants
1	Herb	38
2	Shrub	02
3	Herb/Climber	02
Total		42

Table 4: Diversity in habit of the underground medicinal and aromatic plants.

Used plant parts for propagation of different Medicinal and Aromatic plants were recorded in variable modes and numbers listed in Table 3. Rhizome is used to propagate 19 plant species, 11 species by Bulbs and rest modes were applied for different species of the Medicinal and Aromatic plants.

Table 4 is for diversity in habits of the introduced plant species. 38 species are regenerated for maximum herbs, 02 - 02 plant species were for Shrubs and Herb/climber during the tenure of the present study.

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