Research Article

PROPAGATION OF *RAUVOLFIA SERPENTINE* BENTH. EX KURZ – A SMALL APPROACH TOWARDS CREATING AWARENESS FOR ITS CONSERVATION AND PROPAGATION

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ABSTRACT

Rauvolfia serpentine, Benth. Ex Kurz (Family. Apocynaceae), commonly referred as Sarpagandha, its root has been used for centuries in Ayurvedic medicines for the treatment of mental disorders and antihypertensive. There is a great demand for the alkaloids as well as the raw drug in the National and international market. Its Seed germination rate is highly variable from 5 to 30 percent. It is cultivated on a small scale in India. IUCN has kept this plant under endangered status. The consumption of the raw drug is substantial in the indigenous drug market. This is possible only if the plant is brought under large-scale cultivation in agro climatically suitable areas. Due to this purpose, we carried out experiment for their propagation and conservation. In this experiment propagation was done by seeds in the month of August-September 2013, in poly house and outside the poly house, in coco peat and in soil medium. It is observed that the germination rate of seeds was more in poly house condition and coco peat media rather than outside the poly house and traditional sowing of seeds in the soil media. However it is observed that the acidic pH of soil is more suitable for healthy growth of *R. serpentine* but this experiment shows that it was remarkable grow in alkaline pH also. In this experiment, maximum germinate rate of *R. serpentine* was observed in coco peat medium and poly house condition which will be helpful for conservation, maximum propagation and mass cultivation of *R. Serpentine*.

Keywords: *Rauvolfia serpentine*, endangered, propagation, conservation, coco peat, poly house

INTRODUCTION

Rauvolfia serpentine, Benth. Ex Kurz (Family Apocynaceae), commonly referred to a Sarpagandha.¹ It is one of the most important native medicinal plants of India. In India, the root of sarpagandha has a 400 year history of use in treatment of snakebite, insect stings, nervous disorder, insomnia, mania, epilepsy and in conditions such as angina pectoris and to promote uterine contraction in childbirth.² The hypotensive properties of *R. serpentine* was first discovered by Chopra in 1953,³ but the attention of the Western countries was drawn to it only after the isolation and identification of its most active alkaloid 'Reserpine' by Swiss scientists, Schiller and Mueller, of CIBA Pharmaceuticals in Switzerland, in 1952.⁴

There is a huge demand for the alkaloids- reserpine as well as the raw drug in the national and international market. In pharmaceutical industries, roots of *Rauvolfia* and its products are in great demand. Even though the chemical synthesis of reserpine is possible, it costs more than extracting it from natural resources. Vast collection of this plant from natural habitats has lead to attenuation of plant in the wild.⁵ It is found all over in India, mostly in Bihar, Bengal, Uttar Pradesh, Maharashtra, and found in Burma and Sri Lanka. It is cultivated on a small scale in the central region, i.e. between Sirmor and the Gorakhpur district of Uttar Pradesh in India.⁶ The natural reserves of this plant are declining, especially after reports of its medicinal properties appeared in literatures. International Union for the Conservation of Nature and Natural Resources (IUCN) has kept this plant under endangered status.⁷ The consumption of the raw

drug is substantial in the indigenous drug market. Steps, therefore, must be taken to increase the present propagation and conservation with its mass cultivation. Since the last few years' coco peat, also known as coir dust or coconut mesocarp, has been used in horticulture as a growth media.⁸ Coco peat has good physical properties, high total pore space, high water content, low shrinkage, low bulk density and slow biodegradation.⁹ The results of many experiments revealed that coco peat used alone, or as a component of soil medium for its propagation. The aim of this study was to examine the effect of coco peat as a growing medium and climatic condition of poly house on the seed germination rate and growth of *R. serpentine*.

MATERIALS AND METHODS

Plant material

Authentic Seed was procured from Bharati Herbal Agro - Biotech Sansthan, Daurala, Merut, UP.

Plant was identified and authenticated by Department of Dravyaguna Vigyan, Mahatma Gandhi Ayurved College, Hospital and Research Centre, Salod (H.) and Taxonomist Dr. Ramesh Acharya J.B. Science College, Wardha (M.S.).

Selection of seed for germination: Randomly collected seeds of *R. serpentine* were kept in water; seeds which floated on the water surface were discarded and replaced by same number of seeds. The seeds remaining at the base were taken for seed germination procedure.

Sample size of seeds for germination rate: 108 seeds of *R. serpentine* in each group respectively were taken to access the germination rate. Its seed for germination were divided into following two groups

Group A – In poly house

Tray 1 in coco peat medium

Tray 2 in soil medium

Group B – Outside poly house

Tray 3 in coco peat medium

Tray 4 in soil medium

Seedling trays: Seedling trays used for seed germination of measurement 1.5ft × 1ft.

Propagation: In this experiment propagation was done by seeds. Heavy seeds were sow in the month of August-September 2013, in poly house and outside the poly house condition in coco peat and in soil medium as follows

Tray 1 - A plastic tray having 7 rows and 8 blocks in each row filled with coco peat and introduce one seed in each block. Therefore total 56 seeds were propagated (Figure 1)

Tray 2 - A plastic tray having 6 rows and 8 blocks in each row filled with soil in garden area and introduce one seed in each block. Therefore total 48 seeds were propagated (Figure 1)

These two trays (Figure 3) were kept in Simple poly house which is made up of polythene and having fogging system to control the temperature and humidity.

Tray 3 - A plastic tray having 7 rows and 8 blocks in each row filled with coco peat and sow one seed in each block. Therefore total 56 seeds were propagated (Figure 2)

Tray 4 - A plastic tray having 6 rows and 8 blocks in each row filled with soil in garden area and sow one seed in each block. Therefore total 48 seeds were propagated (Figure 2)

These two trays (Figure 4) were kept in outside the poly house in natural climatic condition

Irrigation - It needs regular irrigation in summer and once in two days' interval in winter season. It is suggested that 15 to 16 irrigations,

Soil: pH of soil is 8.1 to 8.3, nitrogenous matter- 412 kg/hector, phosphorus -2.2 kg/hector, potassium – 172 kg/hector, organic carbon -0.58%, salt -0.196 and rapid 10%

Manures, fertilisers: In this case, no any kind of farm yard manures was used before and after sowing.

Plant Protection: Serious and major infestations of any insect of diseases have not been reported.

Pesticides: No any type of bio-pesticides was used

Transplanting: Germination was starts after 10 days and continues up to 43 days. Seedlings were ready by last week of October 2013 for transplanting it from tray to polythene bags. (Figure 5)

The germination rate, germination period and Seedling Vigor Index (SVI) were calculated as follows.

Formula for seed germination rate¹⁰

Germination percentage was calculated according to the equation ISTA (Indian Seed Testing Association)

Germination (%) = Number of seed germinated / Number of seeds on tray × 100

Germination Period (GP)¹¹

Germination period is the time between the first germination and the end of germination according to Berrie.

Formula for Seedling Vigor Index (SVI)¹¹

The Seedling Vigor Index was calculated according to Hangarter formula-

Seedling Vigor Index = Seedling length (cm) × germinated percentage / 100

OBSERVATION AND RESULT

Table 1: Water floating test for *R. serpentine* seeds

Name of seed	Floated seeds out of 208	Seeds remaining at the base out of 208	Number of replaced seeds
<i>R. serpentine</i> seeds	32	176	32

Table 2: Time to germinate: i.e. the time for the first germination to appear

Name of Seed	<i>R. serpentine</i> (Group A)		<i>R. serpentine</i> (Group B)	
	In coco peat	In soil	In coco peat	In soil
The time for the first seed germination to appear	9 days	13 days	13 days	13 days

Table 3: Germination rate of *R. serpentine*

Name of Seed	<i>R. serpentine</i> (Group A)		<i>R. serpentine</i> (Group B)	
	In coco peat	In soil	In coco peat	In soil
No. of seeds planted	56	48	56	48
No. of seeds that germinated	18	14	09	04
Fraction of seeds that germinated	25*100/58	14*100/48	09*100/56	04*100/48
Percentage of seeds that germinated	43.10%	29.16%	19.07%	8.33%

Table 4: Growth rate of *R. serpentine*

Minimum to maximum height of plants (cm)				
	Group (A)		Group (B)	
Days	In Coco peat	In Soil	In Coco peat	In Soil
9 days	Nil	Nil	Nil	Nil
13 days	1.5 to 2 cm	1 to 1.5 cm	2.5 cm	1 to 1.5 cm
21 days	4 cm	3 cm	3cm	3cm
37days	4-5 cm	3-4cm	3-4cm	3-4cm
60 days	5- 8 cm	4-7 cm	4-6 cm	4-7 cm
90 days	8-10 cm	7-9.5 cm	5-8 cm	5-9.5cm
120 days	10-12 cm	8-11 cm	9-11 cm	8-10.5cm
Average Minimum to maximum height	5.41 to 6.83 cm	4.33 to 6 cm	4.41 to 5.57 cm	4 to 5.91 cm

Table 5: Seedling Vigor Index of *R. serpentine*

	<i>R. serpentine</i> (Group A)		<i>R. serpentine</i> (Group B)	
	In coco peat	In soil	In coco peat	In soil
Average maximum height	6.83 cm	6 cm	5.57 cm	5.91 cm
Seedling Vigor Index	2.94	1.74	1.06	0.49

Figure 1: Inside the poly house (Tray 1 & 2)

Figure 2: Outside the poly house (Tray 3 & 4)

Figure 3: Germination rate of seeds inside the poly house

Figure 4: Germination rate of seeds outside the poly house

A

B

Figure 5: (A) & (B) Seedling of *Rauvolfia serpentina* in month of January 2014

DISCUSSION

International Union for the Conservation of Nature and Natural Resources (IUCN) has kept this plant under endangered status. Propagation of *R. serpentine* is very difficult due to less viability and very low germination percentage. The germination percentage of seed is very poor and variable (25% - 50%) and is often as low as 10 percent which is due to the presence of cinnamic acid derivatives. Propagation by direct sowing of seeds in the field has not been found successful. Sun-dried and stored seeds generally gave a low rate of germination and seeds stored more than 7 - 8 months practically did not germinate.¹² In the present experiment, *R. serpentine* seeds required minimum 09 days and maximum 13 days for germination (Table 2).

There was a significant difference in germination rate with different media and atmospheric condition. The maximum germination percentage of *R. serpentine* seeds 43.10% and 29.16% were noticed in poly house in coco peat and soil media respectively. On the contrary, the minimum germination percentage 19.07% and 8.33% in outside of poly house in coco peat and soil media respectively (Table 3).

After careful observation, it was seen that the germination period for the germination of first seed was 09 days in Group A and 13 days in Group B from the date of sowing. The highest seedling vigor index 2.94 was recorded in Group A (Table.5). The average minimum and maximum growth rate was not significantly differed in Group A and Group B. (Table.4)

In various research studies it showed that the acidic pH of soil is more suitable for healthy growth of *R. serpentine* but in this experiment it was significantly grow in alkaline pH.

CONCLUSION

The germination rate of seeds was more in poly house condition and coco peat media rather than outside the poly house and traditional sowing of seeds in the soil media. While planning for conservation and propagation of *R. serpentine* it is helpful to germinate it in coco peat medium and in poly house condition for maximum germination which will be helpful for its rapid propagation, conservation and mass cultivation.

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