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Research Paper

SEED GERMINATION STUDIES IN SOME MEDICINALLY IMPORTANT ENDEMIC PLANTS OF THE WESTERN GHATS OF KARNATAKA, INDIA

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Abstract

In the present investigation seed germination studies of five plants were under taken. All are medicinally important and distributed in the forests of the Western Ghats. Seeds were collected during respective season and germinated in pots containing soil and sand as media. Initiation of germination varied among the plant species. The overall germination percentage was 59-100%. *Moullava spicata* showed 100% germination at faster rate. Seed viability study showed that *Ensete superbum* contains seed emptiness and low viability as compared to seeds of other plants tested.

Key words: Endemic plants, seed germination, viability.

INTRODUCTION

India is rich with flowering plants and is considered as one of the megadiversity country in the world. Of the 18000 species of flowering plants reported from India one third is considered ad endemic in the Western Ghats nearly 1600 species of plants were endemic among the 5000 reported species, which includes trees, shrubs, climbers and herbs. There are 54 monotypic genera in the Western Ghats (Ahmedullah and Nayar, 1986; Shetty *et al*., 2002). Most of the endemic plants presently categorised as endangered, rare and threatened and vulnerable. Most of the plants in the wild are the source of medicine in folklore, tribal and in traditional systems.

In the present study some endemic plants of the Western Ghats of Karnataka such as *Coscinium fenestratum, Ensete superbum, Moullava spicata, Nothapodytes nimmoniana, Otonephelium stipulaceum* and *Pittosporum dasycaulon* were selected for seed germination and viability studies. The distribution, medicinal uses and place of seed collection of these plants were as follows:

Coscinium fenestratum (Gaertner) Colebr. [Menispermaceae] a woody climber, stem and roots are used in fever, dysentery, ulcers, dyspepsia, jaundice and eye diseases.Generally distributed in India, Sri Lanka, Cambodia and Vietnam. In India it is found in the Western Ghats of Karnataka, Kerala and Tamil Nadu. Red list status is critically endangered. Seeds collected from TBGRI, Palode, Trivandrum during May-June months.

Ensete superbum (Roxb.) Cheesman [Musaceae] a herb, seeds are used in treatment of dysentery and kidney stone found distributed in the rocky hills of the Western Ghats of Karnataka and Kerala. Endemic to India. Fruits collected from Arboretum, Pilikula Nisarga Dhama, Pilikula during January- February months.

Moullava spicata (Dalz.) Nicolson [Caesalpiniaceae] a prickly climbing shrub found in the forests of the Western Ghats of Kerala and Karnataka. The root and bark used the treatment of

pneumonia and skin troubles. Endemic and monotypic genus. Seeds collected from forests of Kogar Ghats, Uttara Kannada, Karnataka during December month.

Nothapodytes nimmoniana (Graham) Mabb. [Icacinaceae] a small tree. the bark contains highly potent alkaloid 7-methoxy camptothecin medicine used against cancer. Indo-Malaysia. In India in the Western Ghats of Maharasthra, Karnataka, Kerala and Tamil Nadu. Vulnerable under Red list status. Fruits collected from Agumbe forests and Gersoppa forests of Karnataka during November – December months.

Otonephelium stipulaceum (Beddome) Radlk. [Sapindaceae] monotypic genus – a tree endemic to the Western Ghats. Seeds collected from forests of Bhagamandala, Madikeri, Karnataka during February-March months.

Pittosporum dasycaulon Miq. [Pittosporaceae] a medicinally important fuel and timber yielding tree endemic to the Western Ghats. Fruits collected from the forests of Kogar Ghats of Shimoga district of Karnataka during January-February months.

The population of these plants reduced due to over exploitation and International Union for Conservation of Nature and Natural Resources (IUCN) has red listed as endangered and critically vulnerable. The natural regeneration also poor in the forests. So there is a need for detailed seed germination study to increase rate of success of seed germination and establishment.

MATERIALS AND METHODS

Fresh mature fruits of *Coscinium fenestratum, Ensete superbum, Moullava spicata, Nothapodytes nimmoniana, Otonephelium stipulaceum* and *Pittosporum dasycaulon* were collected in polythene bags and brought to the laboratory. The seeds were separated from the fruit pulp and washed in distilled water and air dried. They were then used for germination studies. In *Ensete* the seeds were separated from the ripe fruits, washed thoroughly too remove the pulp and only brownish-black seeds which settle down in water were selected for the study.This is done by seed floatation test.

Seed emptiness: seeds of *Ensete superbum* have the problem of emptiness. So the seed lot of were tested for emptiness before conducting the experiment. Seed floatation test was conducted to check the percentage of empty seeds. Five replicate of 100 seeds each were put in distilled water. After two hours floating seeds were removed and considered as empty and sunk seeds were considered to be filled and viable. The floating seeds were counted and cut open to confirm emptiness. Emptiness percentage was calculated by using the formula:

$$\text{Emptiness per cent} = \frac{\text{Empty seeds}}{\text{Total seeds}} \times 100$$

Viability: two standard methods were followed to quickly test seed viability on a random sample of entire lot. Seed samples were cut longitudinally with the aid of sharp edged blade. The seeds possessing firm endosperm and embryo filling the cavity were considered viable while seeds having soft and spongy endosperm; shrivelled discoloured or no embryo and deteriorated with seed coat were considered non-viable. For rapid assessment of viability TTZ test was followed. Seeds were soaked in water for 24 hours and transferred to 0.1, 0..2 and 0.5% solutions of 2,3,5 – triphenyltetrazolium chloride solution and incubated in dark for 16, 18 and 20 hours. The seeds were washed in in water and cut horizontally to observe if the tissues taken the red stain or not.

The seeds were directly sown in earthen pots filled with mixture of red soil, sand and farm yard manure in the ratio 3:1:1 respectively at a depth of 2-3 cm. Watering was carried out regularly once a day and observed daily for initiation and progress of germination until no more germination was observed for more than a week. Radicle mergence was recorded as criteria of seed germination. Germination percentage was calculated as

$$\text{Germination percentage} = \frac{\text{Number of seeds germinated}}{\text{Total seeds}} \times 100$$

RESULTS AND DISCUSSION

Different plant species showed different germination initiation time. In and *Pittosporum dasycaulon* seed germination started after 7 days of sowing, while in *Otonephelium stipulaceum* germination started within 5 days. On the other hand in *Nothapodytes nimmoniana* it took 2 months and in *Coscinium fenestratum* 35 days. The overall germination percentage of seeds of these plants varied from 59 to 100%. Maximum germination of 100 % was recorded in *Moullava spicata* and least germination of 59% was observed in *Nothapodytes nimmoniana.* Gurudev Singh *et al*. (2005) reported 63-93% seed germination in *Saraca asoca* where the seed germination started after one month of sowing. They also found the seeds are of recalcitrant type and all seedlings were healthy without any diseases. The germination percentage of seeds of different plant species were showed in Figures 1-5.

In *O. stipulaceum* a maximum of 96 % germination was recorded at the end of 10th week further there was no germination. Highest germination of 25% was noted in the 3rd week. In *E. superbum* 48% germination was observed in 2nd month of sowing with over all germination of 86%. In *C. fenestratum* a total of 91.25% germination was recorded with a highest of 42.5% recorded in 4th week. In *P. dasycaulon* the total germination percentage was 84% while in the 8th week maximum germination of 17% was recorded. In *N. nimmoniana* 30.29% germination was observed in 3rd month of sowing with over all germination of 59%. Similarly, in *M. spicata* there was over all 100% germination was found with a highest germination percentage of 63.3 was noted in 2nd week after seed sowing.

Emptiness test for seed was used for all the plant seeds, except *E. superbum* and *N. nimmoniana* all the other seeds showed o% emptiness. In *N. nimmoniana* the seed emptiness of 8% and in *E. superbum* it was 30%. Seed viability test carried out by TTZ test for seeds of all plant species in which *E. superbum* the viability was 64%, and in *N. nimmoniana* it was 91% whereas the rest of the plant species the seed viability was 100%.

As these endemic, rare and threatened medicinal plants are of great medicinal value, especially in *N. Nimmoniana* even the small shrubby plant itself exploited from the reserve forests illegally. There should be proper conservation policy for these plants. Plantations in medicinal gardens, arboretum and even reserve forest will definitely improve their population status. So conservation of these plants should be under taken in the first priority.

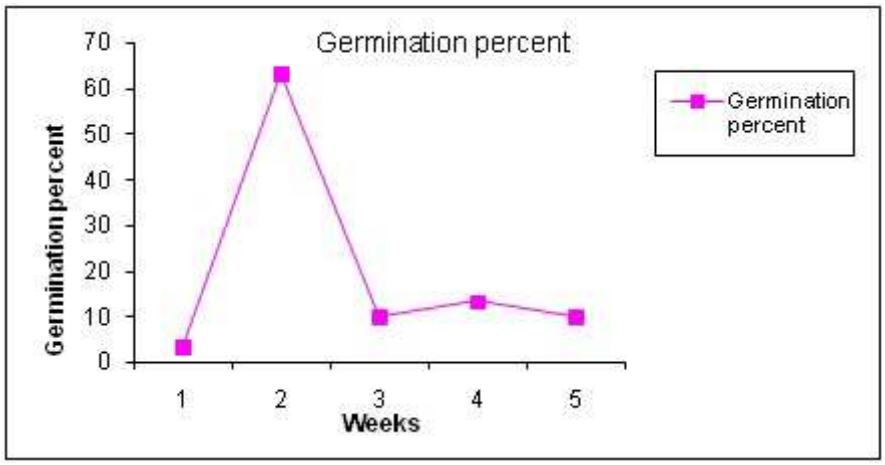

Fig. 1: Seed germination in *Moullava spicata*

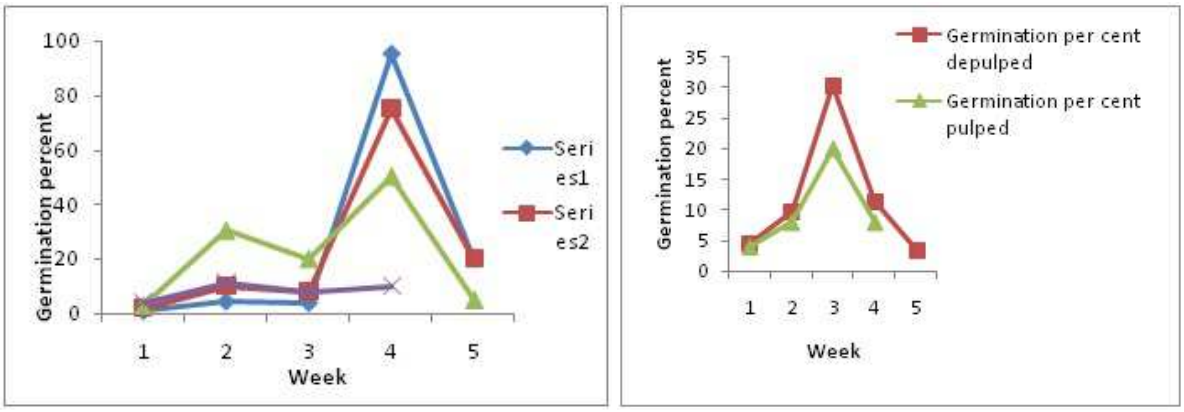

Fig. 2 : Seed germination of depulped and pulped seeds of *Nothapodytes nimmoniana*

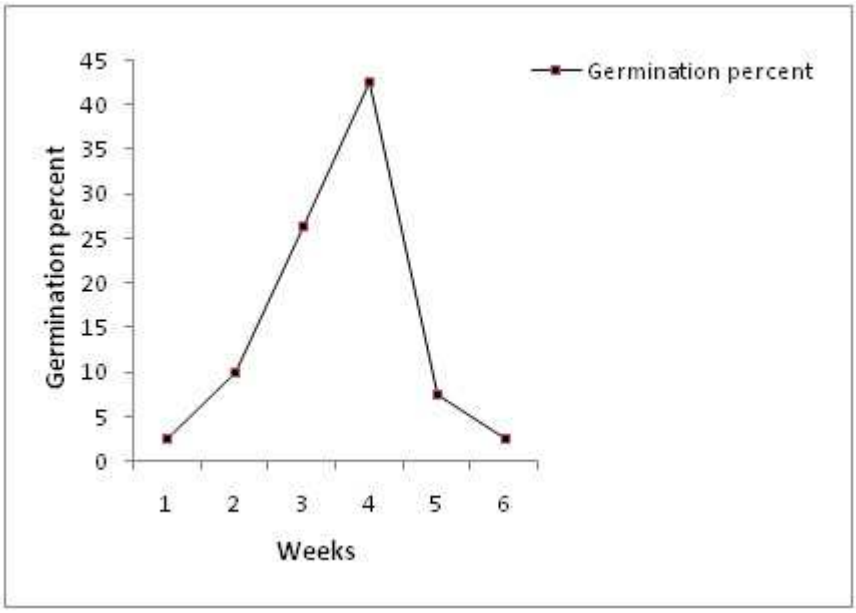

Fig. 3 : Seed germination in *Coscinium fenestratum*

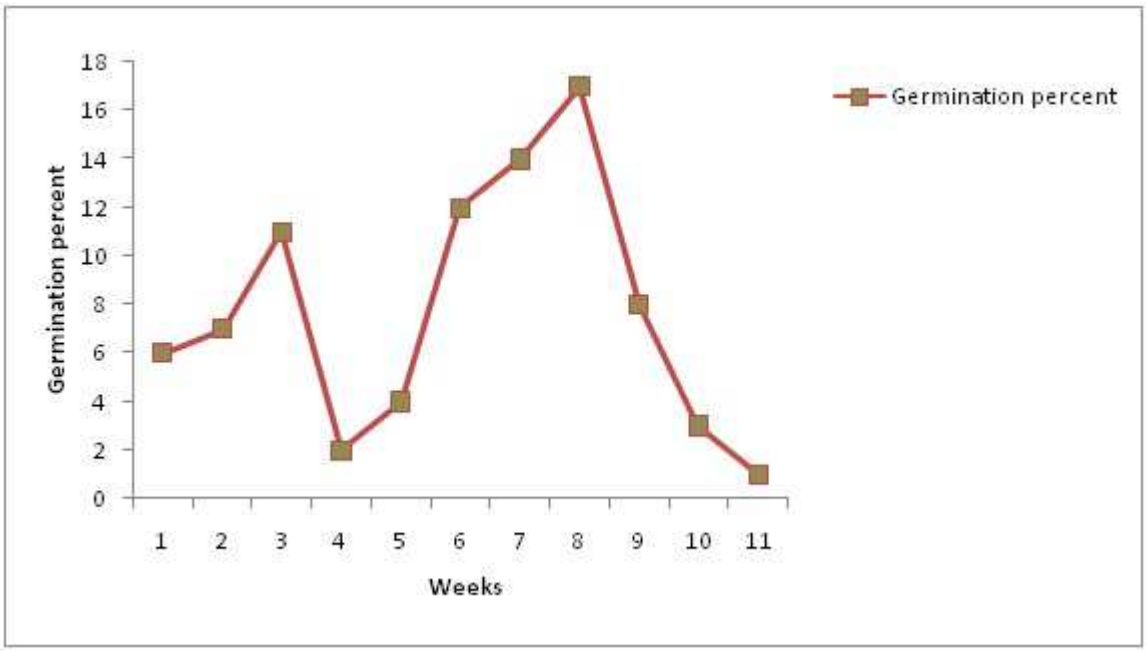

Fig. 4 : Seed germination in *Pittospora dacycaulon*

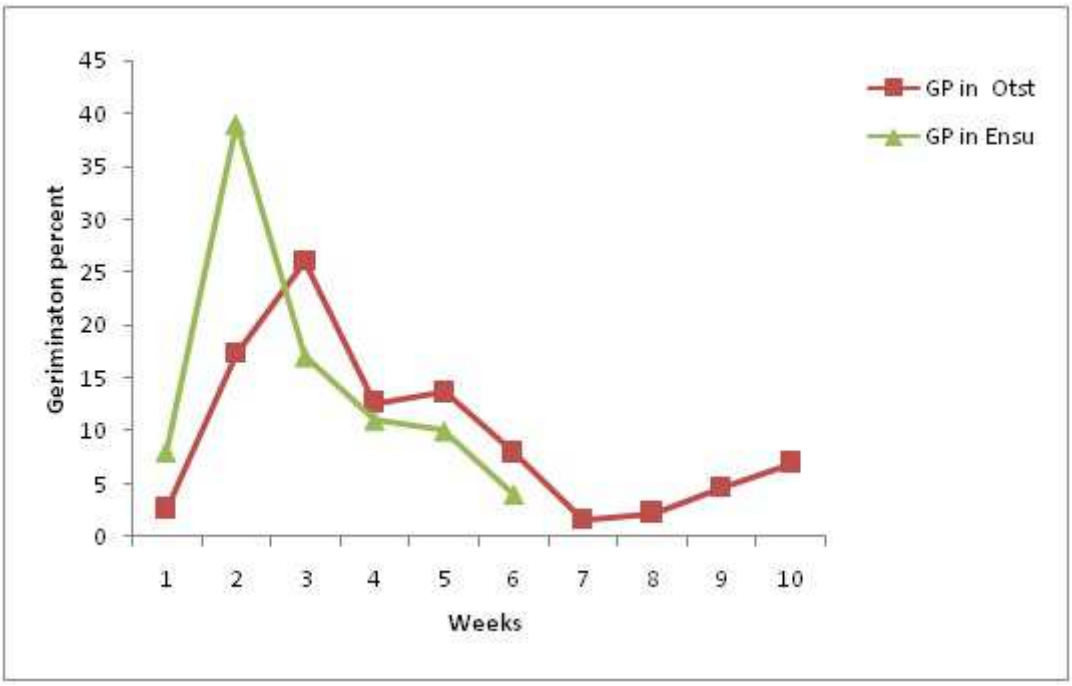

Fig 5: Seed germination in *Otonephalium stipulacaeum* and *Ensete superbum*

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