



Studies on seed germination percentage in some medicinal plants and its physical texture

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Abstract

The present investigation deals with the collection, conservation and seed germination percentage of six medicinal plants. Seeds were collected during respective seasons and calculate the seed germination percentage. The physical texture of seeds of studied plants are noted. The texture of some seeds are smooth, globose, reniform and angled. The seed coat becomes harden in all studied plants except *Vitex negundo*. The lowest seed germination percentage noted in *Abrus precatorius* while highest noted in *Vitex negundo*. All studied plants are medicinally important and distributed in Gautala forest of Satmala ranges.

Keywords: Conservation, seed collection and germination percentage of medicinal plants etc.

Introduction

India is one of the mega-diversity country in the world with rich in highest number of flowering plants. Many medicinally important plants are naturally growing in the country. As some of the medicinally important plants are naturally growing in the Gautala sanctuary of Kannad. Gautala sanctuary of Kannad is protected area of Maharashtra state, India. It lies between Satmala and Ajanta hill ranges of Western Ghats. It is wildlife sanctuary established in the year 1986. There are variety of plants includes trees, shrubs, herbs, woody climbers, twiners and medicinally important trees etc. Some of the medicinal plant species represents a consistent part of natural biodiversity. The Gautala has mega diversity. The ICUN reports showed that the medicinal plants of Europe's are decreases due to cutting and collection of plants from wild. (Allen *et al.*, 2014 [2], A. Arcenz *et al.*, 2010).

Seed germination and seedlings establishment are the initial stages of plant development. The seed germination depends upon different factors like seed maturity, physical properties, humidity, temperature, conservation etc. (Gupta, 2003) [6] According to guideline on conservation of medicinal plants (1993) the strategies used for the conservation of medicinal plant species applied over the world and it known as ex-situ and in-situ conversations. Many times the medicinal plants are exploit through tissue culture (Sharma *et al.*, 2010) [16]. The seed germination of medicinal plant has proved to be useful in the development of appropriate conservation methods of seeds (Khandari *et al.*, 2007) The germination response pattern of seeds is an important phenomenon in the plant life (Mayer and Poljakolf, 1989) [12]. The seed germination pattern of medicinal plants (Hassan and Fardems, 2003, Liza *et al.*, 2010 [7, 11], Rahaman *et al.*, 2012). Since medicinal plants are the importance for conservation and cultivation of rare plant seeds so as that increases the number of plants in environment. A similar work highlighted on seed collection and conservation of some plants from Gautala sanctuary of Kannad (Kshirsagar and Sanghai, 2023) [10]. Some of the medicinal plants increase their commercialization (Dionf *et al.*, 2007) [4] The many studies shows many species disperse seed over extended periods along different maturities

(ENSCONET, 2009) [5] The recent studies (Hoban and Strand, 2015) [8] ex-situ seed collections will benefited. The mechanical collection is a common harvest practice (Scotton *et al.*, 2012) [17] Seeds should harvested as randomly as possible to avoiding the collection of particular characters. (The Royal Botanic Garden Kew, 2001, ENSCONET, 2009) [13, 5]. The seed perform crucial role hence emphasis to be given on seed germination percentage of some medicinal plants and their physical texture of seeds. However, no surveyed reports on germination percentage of medicinal plants in the present studies. Therefore the objectives of present investigation is to explore physical texture of seeds, seed collection and conservation, seed germination percentage of six medicinally important plants like *Abrus precatorius L.*, *Azadirachta indica A. Juss.*, *Semecarpus anacardium L.*, *Terminalia belerica (Gaertn) Roxb.*, *Vitex negundo L.* and *Withania somnifera L.* etc are focused in this studies.

Materials and methods

The mature seeds of Six different plants were collected and preserve in plastic bottles with necessary precautions as a small seed bank. Before preservation to check the seed germination percentage of some medicinally important plants. The seed of *Abrus precatorius L.*, *Azadirachta indica A. Juss.*, *Semecarpus anacardium L.*, *Terminalia belerica (Gaertn) Roxb.*, *Vitex negundo L.* and *Withania somnifera L.* was used for experiments. The seed germination percentage can be calculated by following formula.

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

Observations

1. *Abrus precatorius L.* (Fig.1a)

Common Name: Gunj Flowering: August-November
Family: Fabaceae Fruiting: December-March.

Habitat

It is commonly found in moist and dry deciduous places, it is semi-evergreen perennial twiner, flowers are found in

racemes, pods are 4-6 seeded, 2-5 cm long, linear-oblong dehiscent laterally. The plant is best known for its seeds which are used as beads and in percussion instruments, and which are toxic because of the presence of abrin. Ingestion of a single seed, well chewed, can be fatal to both adults and children. The plant is native to Asia and Australia.

Seed Morphology

The seeds of this plant are macroscopic ellipsoidal obovate-globose, 5.8 x 3.5 x 6-8 mm in diameter. The seeds are bicolor majority of portion are scarlet red in colour with black colour region less on half part at one end. Some times only white colour seeds are also appears in some plants. The 100 seeds weight is near about 14.10 gm. Occasionally some seeds are with ivory -white colour seed coat is very hard without black spots. (Fig.1b)

Seed germination

The seeds are macroscopic, the plant is propagated by seeds and stem cuttings. the germination percentage is very low as their seed coat becomes harden. It requires 20 days for seed germination rarely 1-2 percent seeds are germinated. So it is commonly cultivated through stem cuttings. (Fig.1c)

Medicinally Parts used

Seeds, stem, root and leaves etc

2. *Azadirachta indica* A.Juss. (Fig.2a)

Common Name: Neem/Nimb/Limb Flowering: March-May

Family: Meliaceae Fruiting: May-June

Habitat

It is highly medicinal plant contains various alkaloids, termite repellent, leaf is used in graineries. It is huge medium sized tree with white coloured fragrant flowers appears in axillary panicle. The seeds has medicinal importance. Neem is a fastest growing tree that can reach a height of 10-20 metres, and rarely 30-40 meters. It is evergreen, shedding many of its leaves during the dry winter months. The branches are wide and spreading. The fairly dense crown is roundish and may reach a diameter of 15-25 m. It is dry deciduous tree commonly found in jungles and planted along the road sides. or planted in gardens.

Seed Morphology

The seeds of this plant are macroscopic 1.5 - 2.2 x 0.60 - 0.8 cm. The seeds are with irregular longitudinal lines and brown colour patches 3-angled, ellipsoidal white yellow in colour. the weight of 100 seeds is near about 18.200 gm. The bark and seeds are medicinally important. (Fig.2b)

Seed germination

The seeds are macroscopic and it requires 10-20 days for germination. The total germination percentage is 70% noted. The seedlings survival rate is near about 80-90 %. The complete seed maturity and drying require before germination. (Fig.2c)

Medicinally Parts used

Leaves flowers bark, root and seeds etc.

3. *Semecarpus anacardium* L. (Fig.3a)

Common Name: Bibba /Bhilava/ Agnimulchi.

Flowering: January-May

Family: Anacardiaceae Fruiting: February - September.

Habitat

It is a medium sized tree growing up to 8-12 meters tall. Which has greenish -yellow coloured flowers faciculated in panicles. It is a deciduous tree. Like the closely related cashew, the fruit is composed of two parts, a reddish-orange accessory fruit and a black drupe that grows at the end. The nut is about 25 mm long, ovoid and smooth lustrous black. The accessory fruit is edible and sweet when ripe, but the black fruit is toxic and produces a severe allergic reaction if it is consumed or its resin comes in contact with the skin. The seed inside the black fruit, known as godambi. It was called as 'marking nut' by Europeans because it was used by washermen to mark cloth and clothing before washing, as it imparted a water insoluble mark to the cloth. In medieval times, the plant was thought to aid in memory retention. The seeds is used in Ayurvedic medicine for increasing sperm count, curing diseases related to the digestive system, balancing phlegm, inducing abortion etc. Fruits are drupe type single seeded appears on fleshy receptacles. It is found in deciduous forest area It is common in Gautala sanctuary of Kannad.

Seed Morphology

The seeds of plant are macroscopic just like a nuts. Physically it 1.80 -3.0 x 1.80 x 2.80 x 0.9-1.5 cm. The seeds are obovoid, conical irregularly flattened. the seed coat is with hard surface The seeds are dark brown in colour it is reticulated. The weight of 100 seeds is nearly about 240.20gms. The brown juice release from broad end of seeds. (Fig.3b)

Seed germination

The germination in freshly collected seeds are early, if it gives acid treatment then better germination takes place. It requires 18-35 days for germination of seeds and 40-60 % of seeds are germinated. (Fig.3c)

Medicinally Parts used

Gum extracted from bark, fruit pulp and oil etc.

4. *Terminalia belerica* (Gaertn) Roxb. (Fig.4a)

Common Name: Behada/Bahera Flowering: April-May

Family: Combretaceae Fruiting: June -August.

Habitat

It is known as Behada or bahera or bastard myrobalan It is a large deciduous tree in the Combretaceae family. It is common on the plains and lower hills in South and Southeast Asia, where it is also grown as an avenue tree. It is large tree grown up to 20-25 meter tall with pale-greenish to yellow colour flowers in axillary spike type. it is single seeded, generally fruits are indehiscent drupe type. It is found in moist and dry deciduous forest and the plant is semi-evergreen. The leaves are about 15 cm long and crowded toward the ends of the branches. It is considered a good fodder for cattle. The seeds has 40% of oil whose fatty-acid methyl ester require for major biodiesel in the US.

Seed Morphology

Seeds are macroscopic 1.8 -2.1 x 1.8-1.9cm. The seed coat is hard, the surface is globose and five ribbed. The 100 seeds weight is near about 215.5gm. The hilum is minute. (Fig.4b)

Seed germination

For seed germination soaking of seeds in water for 25 hours. Natural regeneration occurs through seeds. The germination percentage of seed near about 65-75% and it require 18-45 days to germinates. (Fig.4c)

5. Medicinally Parts used: Fruit and seed oil etc.

1. *Vitex negundo* L. (Fig.5a)

Common Name: Nirgudi/ Nilpushpa/ Nirguda. Flowering: January- March

Family: Lamiaceae Fruiting: March - June.

Habitat

It is a large shrubs or sometimes it is small tree grow up to 6-7 meter tall. The flowers are bluish -purple in colour appears on terminal portion of branches and which is paniculate cyme. *Vitex negundo* is an erect shrub or small tree. The bark is reddish brown. Its leaves are digitate, with five lanceolate leaflets, sometimes three. Each leaflet is around 4 to 10 cm in length, with the central leaflet being the largest and possessing a stalk. The leaf edges are toothed or serrated and the bottom surface is covered in hair. The fruits are succulents single seeded. Ovoid or broadly egg shaped, companulate. It is commonly grown in deciduous forest or hedges along the crop fields.

Seed Morphology

The seeds are small macroscopic 4-5 x 4.0 - 4.8 mm. which is fucus black in colour. The surface is punctate. the 100gram seeds weight nearly about 2.20gms. (Fig.5b)

Seed germination

The seed are small macroscopic, the seed germination percentage is very high up to 85-95% sprouting. The seeds are germinated easily within 4-6 days. (Fig.5c)

Medicinally Parts used

Leaves, stem, flower and seed oil etc.

6. *Withania somnifera* L. (Fig.6a)

Common Name: Ashwagandha/ Askandha / winter cherry.

Flowering: March-May Fruiting: May- July Family: Solanaceae

Habitat

It is under shrub grow up to 1-2 meter in height, branched are erect, flowers are greenish yellow sessile type inflorescence cyme, fruit are berried type. It is an evergreen shrub in the Solanaceae or nightshade family that grows in India, the middle East, and parts of Africa. The plant, particularly its root powder, has been used for centuries in traditional Indian medicine. Although used in herbalism and sold as a dietary supplement. It is found in dry open areas, waste lands and along the road sides.

Seed Morphology

The seeds are macroscopic, reniform, ovoid or cordate shape slightly compressed. the seed coat is thick, surface of seed is scrobiculate. The seeds are 1.8-2.1 x 2.1 -3.5 mm. The 100 seeds weight is near about 1.2 gm. The seeds are yellow coloured hilum is notched or narrow slit. (Fig.6b)

Seed germination

The seeds are germinated within 20-25 days and the percentage of seed germination is 25-30 %. Naturally it is grown in monsoon season. (Fig.6c).

Medicinally Parts used

Green berries and seed, roots, leaves etc.

Result and discussions

The present study focused on germination percentage of seeds in some medicinally important plants from Gautala sanctuary, Kannad. And also highlighted on seed collection and conservation. The seed of six plants such as *Abrus precatorius* L., *Azadirachta indica* A.Juss., *Semecarpus anacardium* L., *Terminalia belerica* (Gaertn) Roxb., *Vitex negundo* L. and *Withania somnifera* L. was used and the seed germination percentage were calculated. The physical texture of seeds of studied plants are examined. The texture of some seeds are smooth, globose, reniform and angled.

Following table & graphical representation shows germination percentage of the plant species.

Table 1

Sr.No.	Name of plant	Highest seed Germination percentage	Days require for seed germination
1	<i>Abrus precatorius</i>	02	30
2	<i>Azadirachta indica</i>	90	20
3	<i>Semecarpus anacardium</i>	60	35
4	<i>Terminalia belerica</i>	75	45
5	<i>Vitex negundo</i>	95	06
6	<i>Withania somnifera</i>	30	25

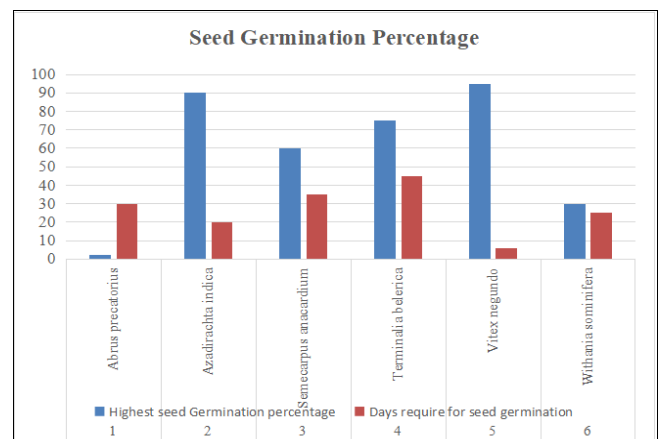


Fig 1

The seed coat becomes harden in all studied plants except *Vitex negundo*. The lowest seed germination percentage noted in *Abrus precatorius* while highest noted in *Vitex negundo*. The seeds are collected from natural habitats. The ample seeds of plants were taken and count the percentage of seed germination. (Thirupathi *et al.* 2012, and Raghav *et al.* 2012) [15, 18].



Fig 1 a. *Abrus precatorius*



Fig.1a seeds



Fig.1b *A.precatorius*



Fig.1c. *A. precatorius*



Fig.2a *Azadirachta indica*



Fig.2 *A. indica*



Fig.2c *A. indica*

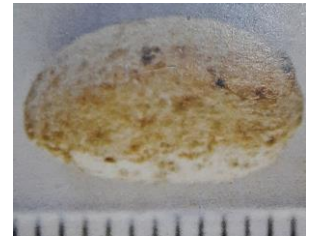


Fig. 2c *A. indica*



Fig.3a *Semecarpus anacardium*



Fig.3a *S. anacardium*



Fig.3b *S. anacardium*

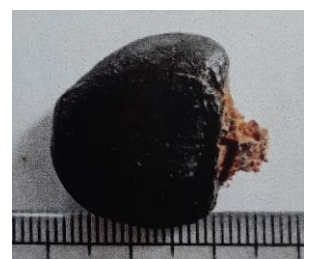


Fig. 3c *S. anacardium*



Fig.4a *Terminalia belerica*



Fig.4a *T. belerica*



Fig.4b *T. belerica*

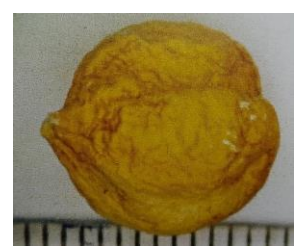


Fig. 4c *T. belerica*



Fig.5a *Vitex nugendo*



Fig.5a *V. nugendo*



Fig.5b *V. nugendo*



Fig.5c *V. nugendo*



Fig.6a *Withania somnifera*



Fig.6a *W. somnifera*



Fig.6b *W. somnifera*

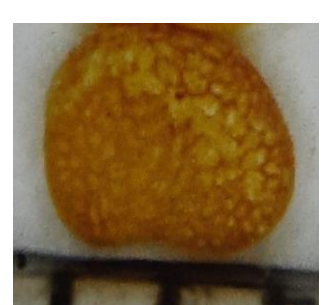


Fig.6c *W.sominifera*

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