



SHORT COMMUNICATION

OPEN ACCESS

Seed biology of *Andrographis elongata* T. And. (Acanthaceae) – a valuable endemic medicinal plant of India

Chinnappan Alagesaboopathi

Department of Botany, Government Arts College (Autonomous), Salem – 636007, Tamilnadu, India

Key words: *Andrographis elongata*, medicinal plant, seed biology, GA₃, seed germination.

Article published on January 20, 2013

Abstract

The present investigation deals with the seed biology of an endemic medicinal plant species, *Andrographis elongata* T. And. of Acanthaceae family. Its leaves, whole plant, root flowers and seed are used as medicine. Its major bitter principles are 2'-oxygenated flavones. It is useful in the treatment of snake bite, diabetes, antidiabetic malarial fever, diuretic, skin disease and constipation. Due to its powerful medicinal importance, the plant is over exploited from the natural habitat and it is very endemic and necessity high conservation utility. The species is under severe threat due to various reasons including reproductive inability. The present research pointed to analyze the seed biological status and germination evaluate in the natural as well as in the laboratory condition. The new seeds showed 72 viability and 42% germinability. But the seeds employed with Gibberellic acid (GA₃) (100, 200, 300, 400, 500 ppm) showed 60 to 78% germinability and 84 percentage of the seed germination noted after 90 days. The highest seed germination was observed in GA₃ 300 ppm (84%).

*Corresponding Author: Chinnappan Alagesaboopathi ✉ ahmmahbubur_rahman@yahoo.com

Introduction

During the current decades medicinal plants gained a substantial significance in agricultural production pharmacy and exportation because of their use as a raw material for the pharmaceutical industries (Abou – Arab and Abou, 2000). Seed germination is regarded as phenomenon which commence with uptake of water by a resting dry seed and terminates with the elongation of the embryonic axis (Bewley, 1997). Data on seed germination and viability is essential for preference of techniques (direct sowing or transplants) for crop establishment, since it can effect further crop uniformity in the field (Zulic and Dudai, 2008).

Andrographis elongata T. And. is a member of the Acanthaceae family and has been extensively used in health care traditions. Species of *Andrographis* Wallich ex Nees (Acanthaceae) are used in the Indian systems of medicine such as Siddha, Ayurveda, Unani, Amachi, Naturopathy and Homeopathy (Alagesaboopathi and Balu, 1999). The genus *Andrographis* as a whole is of important significance to India. The genus exhibits antipyretic properties (Kirtikar and Basu, 1975). This genus consists of 40 species distributed in Tropical Asia (Anonymous, 1948). About 21 species are distributed in India (Gamble, 1982) and all of them available in Tamilnadu (Henry *et al.*, 1987). Among the 21 species 18 species are reported to be endemic to India (Ahmedullah and Nayar, 1986) found in wild in Pachamalai Hills of Eastern Ghats of Tamilnadu, India (11°09'00" to 11°27'00" N latitude; 78°28'00" to 78°49'00" E longitude). This plant are used in traditional medicinal for curing various ailments snake bite, skin diseases, malarial fever, diuretic, constipation, antidiabetic, diabetes and also veterinary medicines have been attributed to this plant in that traditional usage of Indian medicine (Subramanian *et al.*, 1995; Alagesaboopathi and Balu, 1999; Alagesaboopathi *et al.*, 2007; Chinnappan Alagesaboopathi, 2010; Alagesaboopathi, 2012). It is used to manage antipyretic and earache (Subramanian *et al.*, 1995; Neelima *et al.*, 2011).

In India, *A. elongata* (Fig 1) has already been listed as an endemic species (Ahmedullah and Nayar, 1986). The species is under difficult warning due to degradation of natural habitat, forest dwelling nature, reproductive in efficiency and fragmentation of population and unscientific overexploitation of the plant for medicinal applications which have resulted in the dwindling of population in the wild. Therefore, the present study was aimed to investigation the seed biology of *A. elongata* including seed germinability and seen viability for the sustainable development of this endemic species in the wild. The whole plant are reported to contain flavones. The medicinally active compound of *A. elongata* is flavones with many biotherapeutics (Jayakrishna *et al.*, 2001). There is no previous report on seed biology characteristics of *A. elongata*.

Materials and methods

Mature seeds of *A. elongata* were collected in February, 2012 from Pachamalai Hills of Eastern Ghats of Tamilnadu, India. The seeds were dried for 10 days at room temperature (25±2°C) and stored in screw capped bottles under ambient conditions before research during the following July 2012. During the month of August (4.8.2012) about 50 number of seeds of five plastic pods were sown in a plastic pots (11.5cm × 10.5cm) filled with garden soil and sand mixture (1:2). The plastic pot was put in a laboratory with the temperature range of 19°+21°C throughout for germination test.

Seeds are sown in soil. Watering was done with the help of a rose-can every alternate day. In laboratory seed germination was studied in plastic pot (Fig 3) with treatment of hormone (GA₃) in various concentration. Before germination investigation seeds were washed with 0.1% mercuric chloride for 3-5 minutes followed by 75% alcohol for 1-3 minutes. The sterilized seed were thoroughly rinsed with distilled water and subjected for different treatments such as 100, 200, 300, 400, 500 ppm of GA₃. Regular observations were made.

Results and discussion

The seed germination investigation revealed that *Andrographis elongata* T. And. was a very slow growing species. It was able of establishing itself in various habitats. *A. elongata*, a species of the Hills, was thus made to found very well in Salem plains, Tamilnadu. The seeds were collected from matured fruits randomly and stored in the screw capped bottles to avoid the damage of viability at the exposed conditions. The stored seeds at this condition noted improve results.

Table 1. The effect of GA₃ on seed germination of *Andrographis elongata*.

Phytohormone	Concentrations	Percentage of germination
Gibberellic Acid (GA ₃)	Control	23
	100 ppm	62
	200 ppm	70
	300 ppm	84
	400 ppm	78
	500 ppm	66

ppm = Concentration in parts per million

The seed germination was started within 12 days in phytohormone, number of seeds germination was noted daily. Germination result is given in Table 1. In control condition seed germination was 23 percentage. GA₃ treatment upgraded the germination percent compared to the control. The highest germination percent was noted in GA₃ 300 ppm (84%), which was followed by 400 ppm (78%), 200 ppm (70%), 500 ppm (66%) and 100 ppm (62%). It was found that exactly after 12 days from the date of sowing, the germination started with the emergence of shoot with the prominence. The root showed its prominence after few days with vigorous development. The germination continued with the growth of primary leaves and roots. After a little more than a month on 26 August 2012, the first two leaves were observed. Subsequent to this on 4th September 2012 the second leaf emerged. After this, the normal growth continued with small changes. Out of 50 number of seeds, 32 showed uniform excellent growth, 10 delayed growth and the balance did not show any sign of growth. Average

germination percentage was 84. The seedlings were robust. The seedlings attained their complete vegetative growth after period of about 90 days. The morphology of the plant follows without any variation from its counterparts of the hills. *Andrographis elongata* a species of the Hills has thus been made to establish successfully for the first time in the Salem (Plains), Tamilnadu, India.



Fig. 1. *Andrographis elongata* in natural habitat



Fig. 2. Germinated seedlings.

The similar results were noticed by various workers (Alagesaboopathi and Senthilkumaran, 2006; Rawat and Vashistha, 2011; Ramasubbu *et al.*, 2012) and confirmed the seed germination of *A. elongata*. From the above results it may be summarized that the gibberellic acid (GA₃) plant phytohormone can be approved for the development of seed germination. There is no previous report on seed germination studies of *A. elongata*. Further investigations on mechanism of seed dispersal, seed

storage and temperature tolerance will support in developing the conservation strategies of this an endemic and medicinally important plant.

Acknowledgements

My sincere thanks to Professor C.S.Suriyanarayanan, Head, Department of Botany, Government Arts College (Autonomous), Salem, Tamilnadu for his support and providing lab facilities.

References

- Abou – Arab A, Abou AK.** 2000. Heavy metals in Egyptian species and medicinal plants and the effects of processing on their levels. *J. Agric Food Chem.* **48**, 2300-2304.
- Ahmedullah M, Nayar M.P.** 1986. Endemic plants of the Indian Region. Botanical survey of India, Calcutta. **1**, 143-146.
- Alagasaboopathi C, Maharajan S, Iniyavan M.** 2007. Ethnomedicinal plants used by tribals of Pachamalais, Trichirappalli district, Tamilnadu, India. *Plant Archives.* **7**, 341-342.
- Alagesaboopathi C, Balu S.** 1999. Ethnobotany of Indian *Andrographis* Wallich Ex Nees *J. Econ. Taxon. Bot.* **23**,29-32.
- Alagesaboopathi C.** 2012. Ethnomedicinal uses of *Andrographis elongata*. T And – An endemic medicinal plant of India. *International Journal of Recent Scientific Research* **3(4)**, 231-233.
- Alagesaboopathi C, Senthilkumaran G.** 2006. Seed germination studies on *Andrographis lineata* Nees. An endemic species of medicinal importance. *Res. on Crops* **7(1)**, 353-354.
- Anonymous.** 1948. Wealth of India – Raw Materials Vol.I, CSIR, New Delhi. p. 76 – 78.
- Bewley JD.** 1997. Seed germination and dormancy *Plant Cell.* **9**, 1055-1066.
- Chinnappan Alagesaboopathi.** 2010. Vegetative propagation of *Andrographis ovata*. *J.Trop. Med. Plants.* **11(2)**, 215-217.
- Gamble JS.** 1982. Flora of the Presidency of Madras, Vol.II. Botanical Survey of India, Calcutta, p. 1045-1051.
- Henry AN, Kumari GR, Chitra V.** 1987. Flora of Tamilnadu, India, Series 1: Analysis. Vol.II. Botanical Survey of India, Southern Circle, Coimbatore. p. 138–141.
- Jayakrishna G, Hariskshore P, Venkata Rao C, Gunaseka D, Blond A, Bodo B.** 2001. Two new 2' – oxygenated flavones from *Andrographis elongata*, *Chem. Pharm. Bull.*, **49(12)**, 1555-1557.
- Kritikar KR, Basu BD.** 1975. Indian Medicinal Plants. Bishen Singh Mahendrapal Singh, New Delhi. III, 1884-1886.
- Neelima M, Prasad GP, Penchala Pratap G, Jyothi B.** 2011. Ethnobotanical studies in Rapur forest division of Nellore district in Andhra Pradesh. *Life Science Leaflets* **11**, 333-345.
- Ramsubbu R, Chandra Prabhu A, Kumuthakalavalli R.** 2012. Seed biology of *Coscinium fenestratum* (Gaertn.) Colebr – A critically endangered medicinal plant of Western Ghats. *J. Med. Plants. Res.* **6(6)**, 1094-1096.
- Rawat R, Vashistha DP.** 2011. Seed germination studies of *Andrographis paniculata*. *Int. J. Med. Arom. Plants.* **1(3)**, 348-350.
- Subramaniam A, Pushpangadan P, Pushpangadan P, Rajasekaran S, Latha PG.** 1995. Antipyretic activity of TBR – 022, A herbal formulation, *Ancient Science of Life.* **15**, 7-14.
- Zutic I, Dudai N.** 2008. Factors affecting germination of Dalmatian sage *salvia officinalis* seed *Acta Horticulture (ISHS)* **782**, 121-126.