

## Effect of Water uptake on Germinability in Seeds of Some Medicinal Plants, Uttarakhand, India

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### Abstract

Three important medicinal plants of Uttarakhand, India were used in the present study. The effect of different imbibitions time and percentage were first time reported on seed germination and early seedling growth in *Withenia somnifera*, *Pyracantha crinulata* and *Andographis paniculata*. The initial weight of 800 seeds from each species were taken and dipped in water for imbibition. In every 3<sup>rd</sup> hr. 100 seeds were taken out and after weighing kept in seed germinator at 25<sup>o</sup>C temperature and 16/8 hr. photoperiod for germination test, the process was done till to 24 hr. In *Withenia somnifera* maximum germination (38%) was reported after 24 hr. imbibition while in *Pyracantha crinulata* maximum germination (94%) was reported after 12 hr imbibition and in *Andographis paniculata* 15 hr and 24 hr imbibition showed maximum germination (80%). [The Journal of American Science. 2009;5(4):123-128] (ISSN 1545-1003).

### Introduction

Each living organism has its own set of environmental conditions under which it grows most efficiently. Plant and environment interaction primarily regulates the survival of all living being on the earth. Water is one of the most remarkable and essential components for all life. It comprises approximately 85 to 95% of the initial fresh weight in physiological active herbaceous plants. If the water contents in most of the species falls much below this level many of the physiological activities of plants are impaired. Water is an important necessity for germination (Purohit, 2008). There is a great irregularity in the rate of water absorption by plant materials, including cotyledons of pea, corn, grains and seeds of *Xanthium*, *Gossypium*, and *Hibiscus*, and tissue of *Auricularia*. It was determined that the rate of intake is rapid at first, gradually falling off as more water is taken up until it approaches zero as the tissue becomes nearly saturated. Finally absorption ceases, due to complete saturation or to the balance of outward diffusion of soluble substances from the tissues with inward diffusion from the surrounding solution. Seed priming is a pre-sowing strategy for influencing seedling development by modulating pre-germination

metabolic activity prior to emergence of the radicle and generally enhances germination rate and plant performance (Bradford, 1986; Taylor and Harman, 1990). During priming, seeds are partially hydrated so that pre-germinative metabolic activities proceed, while radicle protrusion is prevented, then are dried back to the original moisture level (McDonald, 2000).

### Material and Method

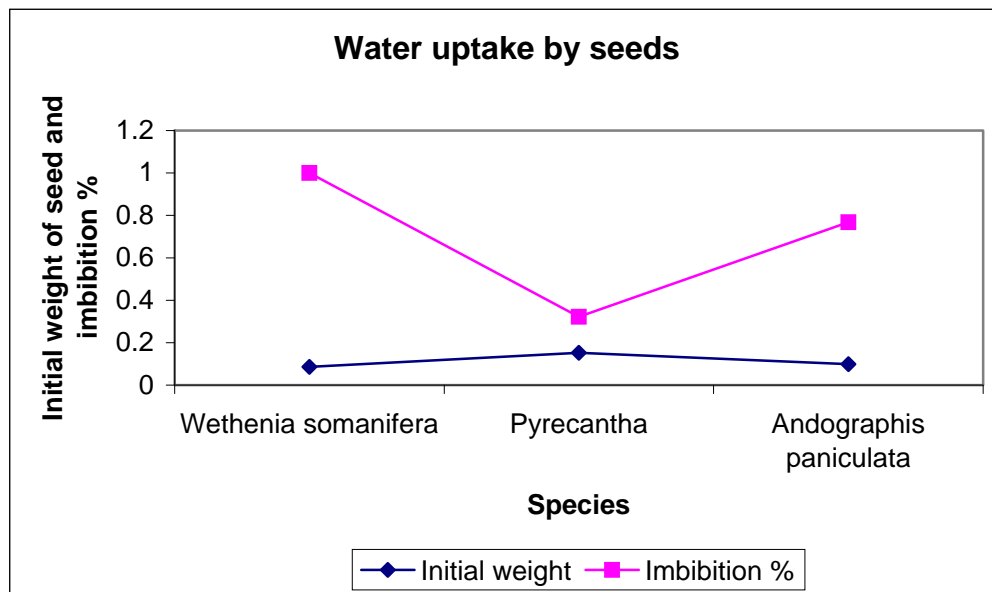
The present study was carried out with the objective to evaluate the effect of different imbibition time on germinability in seed of *Withenia somnifera*, *Pyracantha crinulata* and *Andographis paniculata*. This is first time reported, about every 3<sup>rd</sup> hr. imbibition percentage till to 24 hr. and its effect on germination in above three important medicinal plants. In the present investigation the initial weight of 800 seeds from each species were taken and dipped in water for imbibition. In every 3<sup>rd</sup> hr. 100 seeds were taken out and after weighing kept in seed germinator at 25<sup>o</sup>C temperature and 16/8 hr. photoperiod for germination test, this process was done till to 24 hr. Data were observed daily for radical emergence and early seed germination.

## Result and Discussion

Germination and seedling establishment are critical stages in the plant life cycle. In crop production, stand establishment determines plant density, uniformity and management options (Cheng and Bradford, 1999). In arid and semi-arid environments, the water needed for germination is available for only a short period, and consequently, successful crop establishment depends not only on the rapid and uniform germination of the seed, but also on the ability of the seed to germinate under low water availability (Fischer and Turner, 1978). However, if the stress effect can be alleviated at the germination stage, chances for attaining a good crop with economic yield production would be high (Ashraf and Rauf, 2001).

In the present study Imbibition percentage directly affected the germination percentage, in all three plants (Table-1). In

*Withenia somnifera* maximum germination (38%) was reported after 24 hr. imbibition (Fig.1 and 2-a) while in *Pyracantha crinulata* maximum germination (94%) was reported after 12 hr imbibition (Fig.1 and 2-b) and in *Andographis paniculata* 15 hr and 24 hr imbibition (Fig.1 and 2-a) showed maximum germination (80%). The early seed germination in all three species were recorded in 24 hr imbibition, in *Withenia somnifera* germination was start after 7<sup>th</sup> day while in *Pyracantha crinulata* and *Andographis paniculata* germination was start after 6<sup>th</sup> and 4<sup>th</sup> days respectively. Similarly Some researchers have indicated that the main reason for germination failure was the inhibition of seed water uptake due to a high salt concentration (Coons et al., 1990; Mansour, 1994), whereas others have suggested that germination was affected by salt toxicity (Leopold and Willing, 1986; Khajeh-Hosseini et al., 2003).



**Fig. 1** Initial weight and total water uptake by seeds of medicinal plants

**Table-1 Effect of Imbibition on Germination behavior of *Withenia somnifera***

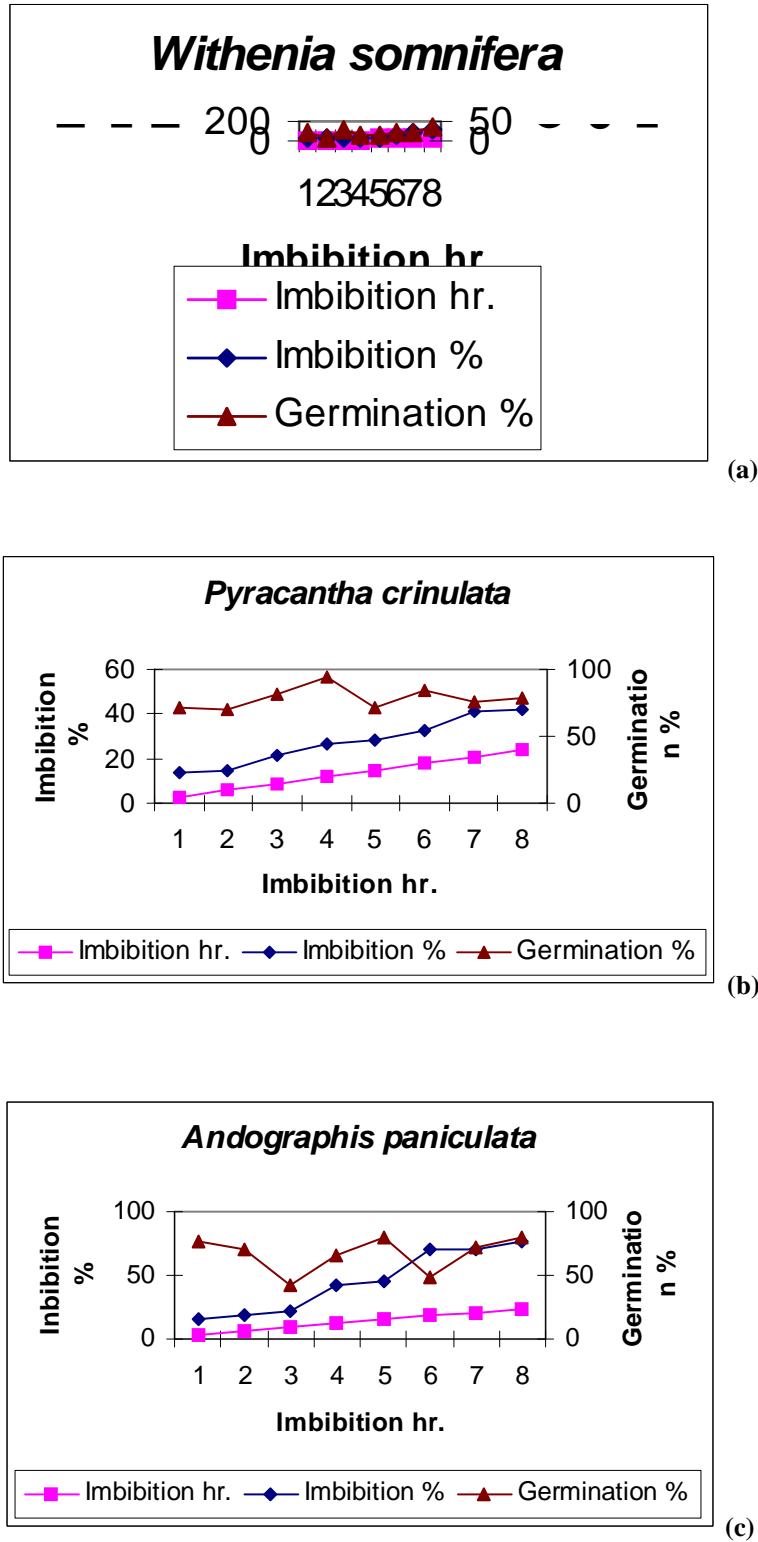
Imbibition hr.	Imbibition%	Germination%	Days required for onset of germination	Days required for completion of germination
3	18.6	18	10	28
6	22	8	12	30
9	33.7	26	9	26
12	38.8	16	14	34
15	40.6	12	14	34
18	54.6	20	10	28
21	80.2	18	12	30
24	100	38	7	22

**Table-2 Effect of Imbibition on Germination behavior of *Pyrecantha crinulata***

Imbibition hr.	Imbibition%	Germination%	Days required for onset of germination	Days required for completion of germination
3	13.8	72	12	15
6	14.4	70	10	12
9	21.7	82	12	10
12	26.3	94	8	10
15	28.2	72	14	15
18	32.2	84	10	12
21	41.4	76	10	12
24	42.2	78	6	9

**Table-3 Effect of Imbibition on Germination behavior of *Andographis paniculata***

Imbibition hr.	Imbibition%	Germination%	Days required for onset of germination	Days required for completion of germination
3	16.1	76	10	12
6	19.1	70	9	12
9	22.2	42	10	14
12	42.4	66	10	14
15	45.4	80	6	10
18	69.6	48	9	12
21	70.7	72	9	12
24	76.7	80	4	8



**Fig. 2** Effect of Imbibition percentage on seed germination behavior of (a) *Withenia somnifera* (b) *Pyracantha crinulata* and (c) *Andographis paniculata*

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