Int.J.Curr.Microbiol.App.Sci (2018) *7*(1): 2539-2543

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 7 Number 01 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.701.305

Seedling Parameters as Influenced by Seed Treatment in Sarpagandha (*Rauvolfia serpentina* Benth.)

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Keywords

Seed treatment, Sarpagandha, *Rauvolfia serpentina*

Article Info

Accepted:
20 December 2017
Available Online:
10 January 2018

A B S T R A C T

The experiment was carried out to know the effect of different seed treatments on seedling growth parameters in sarpagandha. The experiment was laid out in completely randomized design with seven treatments, replicated thrice. Among the different seed treatments tested, GA_3 (1000 mg L^{-1}) treatment was found to be the best, recording earliness to reach four leaf stage, highest values for shoot and root length (10.99 and 7.06 cm, respectively) and vigour index (901.91). The GA_3 treatment resulted in 39.06 per cent reduction in number of days to reach four leaf stage, 74.44 per cent increased shoot length, 15.93 per cent increased root length and 561.03 per cent increased vigour index over the control.

Introduction

Rauvolfia serpentina (L.) Benth. Ex. Kurz., commonly known as sarpagandha is an indigenous medicinal herb of Indian sub-continent, mentioned in ancient Indian medicinal literature, 3000 years back. It belongs to Apocynaceae family and the name *Rauvolfia* is assigned to the genus in honour of a German physician – Leonhart Rauvolf. Among 170 species found, *Rauvolfia serpentina* (2n=22) is the chief, commercial source of important alkaloids. The roots of this plant have been used in the indigenous system of medicine. The roots are being used in the treatment of snake bite, insect stings, nervous disorders and psoriasis. It is also used in Ayurveda, Unani, Homeopathy and Siddha systems of medicines for the treatment of high blood pressure, insomnia, cardiac diseases and a number of mental problems such as psychic disorders, mental retardation, epilepsy, agitation and neurotic disorders, asthma, hypochondriasis, certain forms of insanity, acute stomach ache and painful delivery. Apart from traditional use in health care and culture it has been increasingly used in pharmaceutical industries. ‘Serpasil’ tablet for high blood pressure is prepared from roots. About 30 alkaloids are known to exist in this plant and the total alkaloid content ranges from 1.7 to 3 per cent of dried roots. The most important alkaloids are reserpine, serpentine, ajmaline, ajmalicin, rauvolfinine, recinamine and deserpidine. Continuous exploitation of sarpagandha from forests without taking proper care of its regeneration has resulted in decline in wild populations, rendered it to a vulnerable and threatened state, particularly in India (Farooqi and Sreeramu, 2001). Indiscriminate harvesting, loss of habitat, human and bio-interference, over-exploitation, *etc*. pose further serious threat to its wild resources. In view of the increasing demand for good quality material and need for conservation of natural resources, it has become necessary to develop proper agro-technology for its domestication and cultivation on scientific lines. The seed propagated crop is known to give good quality material and higher yield but, seed germination is very poor in sarpagandha. It is reported to vary from 5 to 30 per cent even when only heavy seeds are chosen for sowing, though the seeds appear to be perfectly normal externally (Farooqui and Sreeramu, 2001). Hence, it is necessary to improve the seed germination in sarpagandha.

Materials and Methods

The experiment was conducted at KRC College of Horticulture, Arabhavi, Gokak (Tq.) Belagavi (Dist.), Karnataka during October – December, 2015, to test the effect of different seed treatments on germination in sarpagandha. The seeds were collected from the wild stand of sarpagandha plants found in the evergreen forests of Sirsi, Uttara Kannada (Dist.), Karnataka. The fruits collected from scattered plants found in the lower storey of evergreen forests were pulped manually to extract the seeds. Extracted seeds were washed in clean water and dried in shade. These seeds were subjected to floating test by immersing in water. The seeds which sink in water were selected for germination experiment.

The experiment comprised of seven treatments with three replications, laid out in Completely Randomized Design. The seeds were subjected to different treatments, T_1: overnight water soaking, T_2: overnight soaking of seeds in GA_3 (1000 mg l^{-1}) solution, T_3: soaking seeds in concentrated H_2SO_4 for one minute, T_4: overnight soaking of seeds in KNO_3 (1%) + HNO_3 (1%) solution, T_5: overnight soaking in cow urine (collected on the previous day), T_6: overnight soaking of seeds in cow dung slurry (cow dung : water in 1:1 ratio) and T_7 being the control (without any treatment). Hundred seeds were used for soaking in each of the treatments. The seeds after treatment were sown in protrays (of 50 wells), filled with coco peat and watered frequently based on necessity. The protrays were maintained in the indoor (ambient) condition in the laboratory.

Results and Discussion

Days to four leaf stage

The number of days to reach four leaf stage (Table 1) was significant due to seed treatments. The seedlings took minimum number of days to reach four leaf stage in GA_3 (69.67) compared to rest of the treatments whereas, maximum was observed in control (114.33). Comparison of means of treatments indicated that, GA_3 treatment lead to 39.04 per cent reduction in number of days taken to reach four leaf stage.

Shoot length

The data pertaining to the shoot length revealed the significant difference among the treatments (Table 1). The shoot length was maximum in GA_3 treatment (10.99 cm). However, it was on par with KNO_3 + HNO_3 treatment (10.48 cm) and cow dung slurry treatment (9.32 cm). The lowest shoot length was recorded in the control (6.30 cm).

Table.1 Shoot length, root length and vigour index at four leaf stage, as influenced by seed treatment in sarpagandha

Treatment	Days to 4- leaf stage		Shoot length (cm)		Root length (cm)		Vigour index	
	Mean	Per cent deviation* (Earliness)	Mean	Per cent deviation*	Mean	Per cent deviation*	Mean	Per cent deviation*
T_1: Water soaking	107.00	6.41	6.46	2.54	5.94	-2.46	206.57	51.40
T_2: GA_3 (1000 mg l^{-1})	69.67	39.06	10.99	74.44	7.06	+15.93	901.91	561.03
T_3: Conc. H_2SO_4 (for 1 min.)	90.00	21.28	7.71	22.38	5.32	-12.64	260.94	91.25
T_4: KNO_3 + HNO_3 (1% each)	96.00	16.03	10.48	66.35	6.12	+0.49	487.02	256.95
T_5: Cow urine treatment	110.33	3.50	8.44	33.97	4.57	-24.96	221.12	62.06
T_6: Cow dung treatment	94.67	17.20	9.32	47.94	5.76	-5.42	543.29	298.19
T_7: Control	114.33	-	6.30	-	6.09	-	136.44	-
S.Em ±	1.46	-	0.24	-	0.17	-	14.18	-
C.D. at 1 %	6.19	-	1.01	-	0.72	-	59.69	-
CV (%)	2.61	-	4.87	-	5.06	-	6.23	-

*Per cent deviation for the mean of respective treatment over control

There was an increment of 74.44 and 66.35 per cent in shoot length in GA_3 and KNO_3+HNO_3 treatment, respectively when compared to control.

Root length

The data on root length showed the significant difference among the treatments (Table 1). The significantly highest root length was recorded in GA_3 treatment (7.06 cm) compared to rest of the treatments. The lowest root length was recorded in control (4.57 cm). There was an increased root length of 15.93 per cent in GA_3 treatment over control.

Vigour index

The data pertaining to vigour index recorded significant difference among the treatments (Table 1). Among the seed treatments, significantly highest vigour index was recorded in GA_3 (900.25). The lowest value for vigour index was seen in control (136.44). The vigour index in seed treatment with GA_3 recorded 561.03 per cent increase over control.

There was significant difference among the treatments for seedling parameters *viz*., days to four leaf stage, shoot length, root length and vigour index (Table 1).

The number of days taken for attaining four leaves in germinated seedling was significantly lower in GA_3 (69.67) compared to rest of the treatments. However, significantly higher number of days to attain four leaves was observed in control (107.00). Seed treatment with GA_3 lead to 39.06 per cent reduction in number of days taken to reach four leaf stage.

The shoot length was maximum in GA_3 treatment (10.99 cm) and it was on par with KNO_3 + HNO_3 treatment (10.48 cm) and cow dung slurry treatment (9.32 cm). The lowest shoot length was recorded in the control (6.30 cm). There was an increment of 74.44 and 66.35 per cent in shoot length in GA_3 and KNO_3+HNO_3 treatment, respectively over control. Significantly highest root length was recorded in GA_3 treatment (7.06 cm) compared to other treatments and the lowest was recorded in cow urine treatment (4.57 cm). There was an increased root length of 15.93 per cent in GA_3 treatment over control. As it is universally known that, GA_3 helps in the cell elongation; the exogenous application of gibberellin might have enhanced the elongation of cells in a better way.

It might have helped in the faster growth of shoot and root as a result, the seedlings might have reached the four leaf stage earlier in seeds treated with GA_3. The results are in accordance with Ponkumar *et al.*, (2008) and Muneshwar (2015) in sarpagandha, Velmurugan *et al.*, (2003) in ashwagandha and Joshi and Pant (2010) in *Canna indica.* Significantly higher vigour index was recorded in GA_3 (901.91) compared to the lowest in control (136.44).

The vigour index in seed treatment with GA_3 recorded 561.03 per cent increase over control. The increased vigour index might be attributed to increased shoot length, root length and germination percentage in seeds due to GA_3 treatment (Table 1).

Among the different seed treatments tested in sarpagandha, GA_3 (1000 mg L^{-1}) treatment was found to be the best, recording earliness in attaining four leaf stage, highest values for shoot and root length and vigour index. The GA_3 treatment resulted in 39.03 per cent reduction in number of days to attain four leaf stage, 74.44 per cent increased shoot length, 15.93 per cent increased root length and 561.03 per cent increased vigour index over control.

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How to cite this article:

Rahul S. Phatak, N.K. Hegde, P.M. Gangadharappa and Laxminarayan Hegde. 2018. Seedling Parameters as Influenced by Seed Treatment in Sarpagandha (*Rauvolfia serpentina* Benth.). *Int.J.Curr.Microbiol.App.Sci.* 7(01): 2539-2543. doi: https://doi.org/10.20546/ijcmas.2018.701.305