J. Phytol. Res. **33**(2): 233-237, 2020 **ISSN 0970-5767**

EFFECT OF ACID TREATMENT ON SEED GERMINATION AND SEEDLING GROWTH OF *CONVOLVULUS MICROPHYLLUS* (SHANKHAPUSHPI) FROM THE INDIAN THAR DESERT

ASHA MASIH*
Dept. of Botany, Dayanand College, Ajmer, Rajasthan 305001, India
***Corresponding Author:E-mail:** asha.masih81@gmail.com

Convolvulus microphyllus (Shankhapushpi) is an important medicinal plant of the Indian Thar Desert. In the present study one year storage effect of seeds on germination behaviour, seedling growth, root: shoot ratio (R/S ratio), germination value (GV) and vigour index (VI) in comparison with fresh ones have been reported. Seeds were scarified with con. H_2SO_4 for different durations (10-90 min). Seeds were also mechanically treated with sand paper to enhance germination and kept for germination under controlled laboratory conditions. Results revealed that 100% seed germination and the maximum values for root & shoot lengths, R/S ratio, mean daily germination (MDG), germination value (GV) in fresh and one year old seeds and vigour index (VI) of fresh seeds were observed in acid scarification for 45 min duration. Maximum peak value of germination (PV) in fresh and one year old seeds and vigour index (VI) of old seeds were noted with 30 min of acid scarification duration.

Key words: *Convolvulus microphyllus,* Acid Scarification, Peak Value Germination, Mean Daily Germination, Germination Value, Vigour Index.

Introduction

Convolvulus microphyllus Sieb. ex Spreng. (syn. *C. pluricaulis* Choisy) is an important medicinal plant of Convolvulaceae family which grows wild in arid and semi-arid regions. It is a prostrate perennial herb found all over India and very common throughout the sandy area. It is a source of an important drug in Ayurveda known as Shankhpushpi. The Shankhpushpi drug is used as brain tonic and as a laxative. It produced anticancerous activities in various experimental gastric ulcer models [1]. In Unani medicine, the drug is used as a sedative and also as a blood purifier. Its syrup prepared with Piper nigrum is prescribed to vitiated blood, bleeding piles and venereal diseases. The plant is also useful in insomnia, insanity, epilepsy, cough and skin disorders, hyperpyrexia and general debility [2].

Seed is a very important part and it has a tremendous role in perpetuation of a plant kingdom. "A seed is the germ of life, a beginning and an end" so that a seed is not only a young dormant plant, but it has an inbuilt food supply and a protective coat that enables it to retain its viability [3]. The hard seed coat appears to be the most important dormancy inducing factor. It is one of the most common types of dormancy occurring in seeds of arid zone plants. Various workers have conducted experiments for acid scarification treatment to the seeds of many Indian desert plants for removal of hard seed coat dormancy [4-8].

In the present investigations, an attempt has been made to study the seeds germination and effect of different pretreatments for breaking hard seed coat dormancy as well as for improvement in germination percentage, germination value

and Vigour Index in *C. microphyllus* under laboratory conditions.

Material and Methods

The seeds were collected from three different sites of the Indian desert, viz. Medical College Campus, Jodhpur (4 km away from University Campus in northwest direction; (site-I), Nagari village, District Jodhpur (85 km from University Campus in northeast direction; (site-II), and J.N.V. University Campus, Jodhpur (Site-III).

First of all dry seeds were cleaned and stored in plastic containers with parad tablets or insecticide to protect seeds from insects. Seeds germination behaviour was studied in fresh and one-year-old seeds. Experiment of seed germination started with moist seed, so seeds were kept in sterilized petridishes. Petridishes were lined with single layer of moistened filter paper. Times to time seeds were moistened with the required quantity of distilled water. All experiments, conduct in triplicate and each petridish contained 10 seeds. Seed germination experiments were conduct with the presence of alternate white light and dark (12 h). Alternative white and dark light obtained from 3 fluorescent tubes of 40 watts. Each fluorescent tube fitted at a height of half meter from the petridishes (1000 Lux) at 28º C in seed germinator. Seed germination (%) and root & shoot lengths of seedlings were measured after 10 days of setting the experiments.

The seeds of *C. microphyllus* possess hard seed coat dormancy and for its removal, seeds were scarified with acid (con. H_2SO_4) for different durations (10-90 min). Seeds were also mechanically treated with sand paper to enhance germination and placed for germination under controlled laboratory conditions.

Germination value and Vigour Index:

Germination value (GV) of fresh and one year stored seeds were calculated for each treatment using the following formula [9].

$GV = PV \times MDG$

Where,

PV = Peak value of germination and it is calculated as follows:

$$PV = \frac{\text{Final germination percentage}}{\text{Number of days that took to reach the peak germination}}$$

MDG = Mean daily germination and calculated with the following formula:

$$MDG = \frac{\text{Total germination percentage}}{\text{Total number of days}}$$

The Vigour Index (VI) was calculated by the following formula [10].

VI = Germination (%) × Seedling length (cm)

Where, Seedling length is the sum of root and shoot lengths.

Above results were subjected to analysis of variance (ANOVA) [11].

Results and Discussion

It was observed that seeds did not germinate in control. Results further revealed that increase in the duration of acid scarification, enhanced germination percentage. Conc. H_2SO_4 pre-treatment for 45 min. gave promising results with cent percent germination. After 45 min duration, germination percentage in fresh and one year old seeds decreased slightly. When fresh and one year old seeds were subjected to mechanical scarification, they showed 73.33 and 80.00% germination, respectively. The root & shoot lengths of fresh and one year old seeds ranged from 0.77 to 2.63 & 1.59 to 2.47 and 1.62 to 3.70 & 1.41 to 2.49 cm, respectively. The R/S ratio in fresh and one year old seeds ranged from 0.485 to 1.080 and 1.070 to 1.522, respectively. The maximum values for root & shoot lengths and R/S ratio of both fresh and old seeds were noted in acid scarification for 45 min duration. The data were significant at 1% probability level**.**(Table 1)

Effects of conc. H_2SO_4 for different durations (10-90 min) and mechanical scarification on peak value of germination (PV), mean daily germination (MDG), germination value (GV) and vigour index

(VI). Results further reveal that MDG in fresh and one year old seeds varied from 3.00 to 10.00 and 2.66 to 10.00, respectively, being maximum in conc. H_2SO_4 for 45 min duration. GV & VI in fresh and one year old seeds ranged from 22.50 to 125.00 & 70.80 to 510.00 and 14.21 to 202.50 & 80.77 to 522.90, respectively. Maximum values of both parameters in fresh and one year old seeds were noted with 45 and 30 min of acid scarification duration, respectively. Highest Peak Value (PV) of germination observed in 30 min of acid scarification duration.(Table 2)

Table1. Results of fresh and one year old seeds of *C. microphyllus* influence by different pretreatments on seed germination, seedling growth and R/S ratio.

Pretreatments	Duration (min)	Germination (%)		Seedling growth (cm)				R/S ratio	
		Fresh	Old	Root		Shoot		Fresh	Old
				Fresh	Old	Fresh	Old		
Control	-	-	-	-	-	-	-	-	-
MS		73.33	80.00	1.73	2.06	2.41	1.96	0.739	1.070
Acid scarification (Conc.H_2SO_4)	10	30.00	26.66	0.77	1.62	1.59	1.41	0.485	1.147
	20	36.66	70.00	1.08	1.92	1.69	1.63	0.645	1.230
	30	43.33	90.00	1.40	3.02	2.13	2. 11	0.663	1.457
	45	100.00	100.00	2.63	3.70	2.47	2.49	1.080	1.522
	60	80.00	86.66	2.22	2.46	2.21	1.82	1.016	1.401
	75	70.00	63.33	1.89	2.21	2.04	1.56	0.791	1.442
	90	70.00	56.66	1.89	2.14	2.43	1.60	0.804	1.360
CD		15.491**	21.265**	0.307**	0.302**	0.327**	0.300**	0.158**	0.231**

MS= Mechanical scarification; and - = No germination.
** = Significant at P = 1%.

Table 2. Results of various pretreatments on seedling parameters in fresh and one year old seeds of *C. microphyllus.*

Pretreatments	Duration (min)	Parameters							
		Fresh				Old			
		PV	MDG	GV	VI	PV	MDG	GV	VI
Control	_	_	_	_	_	_	_	_	_
MS		10.47	7.33	76.81	303.58	13.33	8.00	106.66	321.60
Acid scarification (Conc.H_2SO_4)	10	7.50	3.00	22.50	70.80	5.33	2.66	14.21	80.77
	20	9.16	3.66	33.59	101.54	14.00	7.00	98.00	325.50
	30	14.44	4.33	62.58	152.95	22.50	9.00	202.50	522.90
	45	12.50	10.00	125.00	510.00	14.28	10.00	142.85	495.00
	60	11.40	8.00	91.42	354.40	14.44	8.66	125.16	349.23
	75	14.00	7.00	98.00	275.10	10.55	6.33	66.84	234.32
	90	7.77	7.00	54.44	302.40	7.08	5.66	40.12	90.65

MS= Mechanical scarification; PV= Peak value of germination; MDG= Mean daily germination; GV=Germination value; and VI= Vigour Index.
- = No seedling growth.

Accessibility of suitable and lively seeds at planting time is significant for accomplishing focuses of crop production since great quality seeds go about as an impetus for understanding the capability of different data sources. Unfavourable natural conditions lose both viability and vigour of seeds. Seed coat inhibition is likely the normal reason for dormancy, which was met during the current examination in the seeds of *C. microphyllus.* Sulphuric acid has for quite some time been utilized as perhaps the most well-known and generally utilized chemical agent to upgrade permeability and germination. Chemical treatment on seed coat makes impermeable seed coat as porous. Pretreatment of seeds with conc. H_2SO_4 for 5 min brought about an expansion in germination level of *Austrostipa compressa*.[12] Scarification techniques have

been utilized effectively to break dormancy and start germination of hard covered seeds.[13] Acid scarification for 7 min got 90% germination and higher emergence index in *Berberis aristata.*[14]. Most extreme germination noticed for flava and rubra transforms of *Trianthema portulacastrum* after 10% H_2SO_4 scarification for 15 min.[5] Acid breaks up the fingernail skin over the strophilole just as bits of the subtending malpighian cells, leaving a little roundabout depression with a huge score in the base. Subsequently, the vast majority of water entered through the strophiole.[15]. In the current examinations, conc. H_2SO_4 pretreatments for 45 min brought about greatest germination (100%), higher values of root and shoot lengths, R/S ratio, GV and VI in *Convolvulus microphyllus*.

Conclusion

Thus, it is concluded from the present studies that seeds of *Convolvulus microphyllus*, showed maximum germination percentage, seedling growth, R/S ratio and MDG, with conc. H_2SO_4 pretreatment for 45 min duration. Mechanical scarification was also favourable for breaking hard seed dormancy in *C. microphyllus*. The results of GV and VI did not show any definite trend. Maximum values of both parameters in fresh and one year old seeds were noted with 45 and 30 min of acid scarification duration, respectively. High Peak value (PV) of fresh and one year old seeds was noted with 30 min of acid scarification duration.

Acknowledgemen

Author is very much thankful to the Professor & Head, Department of Botany, (Ecology Lab.), J.N.V. University, Jodhpur for their guidance and all laboratory facilities.

References

1. Sairam, K., Rao, C.V. and Goel, R.K. 2001, Effect of *Convolvulus pluricaulis* Choisy. on gastric ulceration and secretion in rats. *Indian J. exp. Biol.* **39** 350-354.
2. Khare, C.P. 2004, Encyclopedia of Indian Medicinal Plants: Rational Western Therapy, *Ayurvedic and other Traditional Usage: Botany.* Springer-Verlag, Berlin, pp. 523.
3. Freeman, O.L. 1961, Seeds. In: *The Yearbook of Agriculture, (ed.) A Stefferud. USDA, Washington, D.C*., pp. 5-6.
4. Sen, D.N. and Kasera, P.K. 1994, Weed biology and chemical weed control in the *Indian arid zone. In: Sustainable Development of the Indian Arid Zone - A Research Perspective*, (eds.) R.P. Singh and S. Singh. Scientific Publishers (India), Jodhpur, pp. 303-318.
5. Mohammed, S. and Sen, D.N. 1990, Biology and ecophysiology of Trianthema portulacastrum L. (Molluginaceae) in arid ecosystem. *Folia Geobot. et Phytotax*. **25** 145-157.
6. Bhattacharya, A. and Saha, P.K. 1990, Ultrastructure of seed coat and water uptake pattern of seeds during germination in *Cassia* spp. *Seed Sci. & Technol*. **18** 97-103.
7. Saharan, P., Kasera, P.K. and Chawan, D.D. 2001a, Seed polymorphism and germination behaviour of shankpushpi (*Evolvulus alsinoides*). *Annals Arid Zone* **40** 97-99.
8. Tiwari, J.C., Bohra, M.D., Sharma, N.K., Burman, U. and Harsh, L.N. 1998, Pretreatments to enhance germination of *Prosopis juliflora* seed. In: *Prosopis* Species in the Arid and Semi-Arid Zones of India, (eds.) J.C. Tewari, N.M. Pasiecznik, L.N. Harsh and P.J.C. Harris. *The Prosopis Society of India & The Henry Doubeday Research Association*, UK, pp. 39-41.
9. Czabator, F.J. 1962, Germination value: an index combining speed and completeness of pine seed germination. *Forest Sci*. **8** 386-396.
10. Abdul-Baki, A.A. and Anderson, J.D. 1973, Vigour determination in soybean seed by multiple criteria. *Crop Sci*. **13** 630-633.
11. Gomez, K.A. and Gomez, A.A. 1984, Statistical Procedures for Agricultural Research. (2nd ed.). John Wiley & Sons, New York, pp. 294.

12. Baker, K.S., Steadman, K.J., Plummer, J.A. and Dixon, K.W. 2005. Seed dormancy and germination responses of nine Australian fire ephemerals. Plant & Soil 277: 345-358.
13. Gopikumar, K. 2002. Seed germination studies in selected farm forestry tree species. Indian Jour. Forestry 25: 344-346.
14. Thakur, A.S., Thakur, P.S. and Mehta, R. 2005. Effect of pre-sowing treatments on seed germination in Berberis aristata. Indina J. Plant Physiol. 10: 338-343.
15. Baskin, C.C. and Baskin, J.M. 2005. Seeds: Ecology, Biogeography and Evolution of Dormancy and Germination. (5th ed.). Academic Press, USA, pp. 666.