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Seed germination studies on *Kalmegh* (*Andrographis paniculata* Nee

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Abstract: The seed germination study of kalmegh (*Andrographis paniculata* Nees.) was conducted in Completely Randomized Design with 27 treatments replicated thrice. Observations were made on no. of days for germination initiation, number of days required for the first count, germination percentage, root length, shoot length, dry matter production and vigour index. The study revealed that the final count of germination could be taken at eighteenth day. The hot water treatment at 50°C for 5 minutes improved the germination potential of seeds from 62 per cent to 84 per cent. Being a medicinal plant, this treatment is ranked as the best, eco-friendly and cheaper.

Key words : Kalmegh, Germination, Vigour index, Thiourea, KCl, KH_2PO_4, GA_3, H_2SO_4, Hot water, Sand scarification.

Introduction

Kalmegh (*Andrographis paniculata* Nees.) belonging to the family acanthaceae is one of the nineteen species of the genus *Andrographis*, which is indigenous to India and has been used in Indian systems of medicines since time immemorial. The plant is also known as rice bitters in West Indies and King of bitters or Chiretta in England. The fresh and dried leaves of kalmegh and the juice extracted from the herb are official drugs in Indian pharmacopoeia. The whole herb is the source of several diterpenoids, of which the bitter water soluble lactone, andrographolide is important and is distributed all over the plant body in different proportions. In such valuable crop, seed germination is a problem and information available on seed quality is very limited. A systematic study to generate information on standardization of germination test and germination improvement is essential. Keeping these in view, studies were undertaken with the objectives to standardize testing procedure for evaluation of germination and vigour of true seed and to evolve suitable treatments to improve germination.

Materials and Methods

The seeds were collected from the Botani Garden, Tamil Nadu Agricultural Univers Coimbatore and used for the study. The st was conducted during 2001-2002 in Comple Randomized Design with the following treatme and replicated thrice. The treatment consi of soaking of seeds (3 hours) with Thiou (0.5, 1.0, 1.5, 2.0 and 3.0%), KCl (0.5, 1 1.5 and 2.0%), KNO_3 (0.5 and 1.0), KH_2P (0.5, 1.0, 1.5., 2.0 and 3.0%), IAA (250 500 ppm, GA3 (100, 250 and 500 ppr commercial H_2SO_4 (3 min), hot water soaki (at 50°C for 5 min), water soaking (12 hour leaching (12 hours), sand scarification (5 m and control. Observations were made on r of days for germination initiation, number days required for the first count, germinati percentage, root length, shoot length, dry mat production and vigour index.

Results and Discussion

Significant differences were observed germination due to the treatments. Among t various treatments tried, the highest germinati (84%) was registered for hot water treatm

Table 1. Effect of seed treatments on germination and vigour parameters in *Andrographis paniculata* Nees.

Treatments		Germination (per cent)	Shoot length (cm)	Root length (cm)
T_1 - Thiourea	0.5%	50	2.53	1.55
T_2 - Thiourea	1.0%	64	4.11	1.23
T_3 - Thiourea	1.5%	56	1.90	1.32
T_4 - Thiourea	2.0%	38	2.78	1.99
T_5 - Thiourea	3.0%	66	2.49	1.11
T_6 - KCl	0.5%	74	3.82	2.87
T_7 - KCl	1.0%	46	2.91	1.81
T_8 - KCl	1.5%	70	3.70	1.95
T_9 - KCl	2.0%	70	3.26	1.72
T_{10} - KNO_3	0.5%	40	3.96	2.86
T_{11} - KNO_3	1.0%	60	2.70	1.26
T_{12} - KH_2PO_4	0.5%	62	3.17	2.64
T_{13} - KH_2PO_4	1.0%	60	2.7	2.02
T_{14} - KH_2PO_4	1.5%	56	2.02	1.54
T_{15} - KH_2PO_4	2.0%	56	2.02	1.54
T_{16} - KH_2PO_4	3.0%	76	3.29	1.84
T_{17} - IAA	250 ppm	64	3.50	2.23
T_{18} - IAA	500 ppm	70	3.36	2.39
T_{19} - GA_3	100 ppm	68	3.59	1.92
T_{20} - GA_3	250 ppm	74	3.29	2.18
T_{21} - GA_3	500 ppm	74	3.71	1.80
T_{22} - H_2SO_4 (one min)		4	0.6	0.61
T_{23} - Hot water (5 min at 50°C)		84	4.13	2.31
T_{24} - Water soaking (12 hrs)		30	2.9	1.88
T_{25} - Leaching (12 hrs)		12	2.38	1.00
T_{26} - Sand scarification (5 min)		74	3.09	2.22
T_{27} - Control		62	3.83	2.10
SEd		7.6012	0.4375	0.3093
CD (0.05)		15.59	0.8676	0.6346

at 50°C for five minutes. The next best treatments was KH_2PO_4 3.0% (76%) whereas the untreated seeds (control) recorded 62 per cent germination. Krause (1988) reported that soaking the seed for 24-48 hrs in water at 30°C accelerated the germination of *Catharanthus roseus* seed. The germination improvement in *Tephrosia purpurea* was achieved by scarification with sand followed by pre soaking in hot water at 50°C for five min (Sundraraj *et al.* 1971). The highest shoot length of 4.13 cm was recorded in the hot water treatment at 50°C for five min. while in control; the shoot length was 3.83 cm. The highest root length (2.87cm) was obtained for the treatment of soaking in KCl 0.5% solution for 3 hrs, which was closely followed by soaking in KNO_3 0.5% for 3 hrs (2.86 cm). The control seeds recorded 2.10 cm (Table 1). Potassium nitrate acts as a substitute for light (Copeland, 1983) and the germination enhancing effect of KNO_3 was attributed to an increase in cytochrome oxidase activity (ISTA, 1976).

Among the treatments, the hot water treatment at 50°C for 5 min. registered the highest dry matter content of 18.70 mg 10 seedlings^{-1}, which was followed by soaking in

Table 2. Effect of seed treatments on vigour parameters in *Andrographis paniculata* Nees.

Treatments		DMP (mg/10 seedlings)	Vigour index	Abnormal seedling (per cent)
T_1 - Thiourea	0.5%	17.50	204	8.0
T_2 - Thiourea	1.0%	16.60	342	12
T_3 - Thiourea	1.5%	16.35	180	10
T_4 - Thiourea	2.0%	17.20	181	10
T_5 - Thiourea	3.0%	16.95	238	4
T_6 - KCl	0.5%	17.45	495	-
T_7 - KCl	1.0%	17.70	217	-
T_8 - KCl	1.5%	17.60	395	12
T_9 - KCl	2.0%	17.45	349	8
T_{10} - KNO_3	0.5%	16.2	158	-
T_{11} - KNO_3	1.0%	16.25	349	10
T_{12} - KH_2PO_4	0.5%	16.90	184	-
T_{13} - KH_2PO_4	1.0%	16.25	292	12
T_{14} - KH_2PO_4	1.5%	17.05	213	16
T_{15} - KH_2PO_4	2.0%	17.35	199	12
T_{16} - KH_2PO_4	3.0%	18.05	390	-
T_{17} - IAA	250 ppm	16.65	366	8
T_{18} - IAA	500 ppm	16.70	402	12
T_{19} - GA_3	100 ppm	16.70	375	8
T_{20} - GA_3	250 ppm	17.05	405	10
T_{21} - GA_3	500 ppm	17.15	407	14
T_{22} - H_2SO_4 (one min)		16.85	5	-
T_{23} - Hot water (5 min at 50°C)		18.70	540	-
T_{24} - Water soaking (12 hrs)		16.05	143	-
T_{25} - Leaching (12 hrs)		15.0	40	4
T_{26} - Sand scarification (5 min)		17.50	393	4
T_{27} - Control		16.30	368	12
SEd		0.2349	4.2251	1.9626
CD (0.05)		0.4820	8.6695	4.027

KH_2PO_4 3.0% for 3 hrs (18.05 mg 10 seedlings^{-1}). The dry matter content of untreated seeds was 16.30 mg 10 seedlings^{-1}. The highest vigour index of 540 was recorded in hot water treatment at 50°C for 5 minutes, which was followed by soaking in KCl 0.5% for 3 hrs (495). The lowest vigour index of 5 was registered in H_2SO_4 scarification for one minute whereas in control the vigour index was 368. The highest per cent of abnormal seedlings (16.0%) obtained for the treatment of soaking in KH_2PO_4 1.5% solution for 3 hrs, which was closely followed by soaking in GA_3 500 ppm for 3 hrs (14.0%). But in hot water treatment at 50°C for 5 minutes, there was no occurrence of abnormal seedlings (Table 2). The seeds of most plant species are dormant due to hard seed coat, which is impermeable to water and gases (Kohili and Kumari, 1986). From the work of Thomas (1994) on *Cassia sophera*, it is obvious that the dormancy of seeds may be exogenous and coat imposed. The seed coat plays a vital/ major role in this species because it prevents water uptake. The results of present study revealed that soaking seeds in hot water maintained at 50°C for 5 minutes increased the germination of seeds to 84 per cent from 62 per cent. It could be inferred that seeds of kalmegh possess the combined dormancy of physical and innate nature. Hence, the hot water treatment

creased the germination potential due to softening f outer layer of hard seed coat. Being a edicinal plant, this treatment is ranked as hc best, eco friendly and cheaper.

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