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Effect of pre-sowing treatments on the propagation of *Schleichera oleosa* (LOUR.) Oken

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ABSTRACT

Seeds of kusum (*Schleichera oleosa*) exhibits physical and physiological dormancy.A study on "Effect of pre-sowing treatments on the propagation of *Schleichera oleosa*" was conducted during 2021-22.Kusum seeds were subjected to nine treatments which includes GA_3 (100, 300, 500, 1000 ppm), H_2SO_4 (3, 5, 10 min) and cold stratification for improving their germination and growth performance by breaking dormancy exhibited by seed in the present study. Various germination parameters viz germination and survival percentage, germination energy, germination period and growth parameters like root length, shoot length, number of leaves, collar diameter, dry weight of shoot and root, shoot: root ratio for seedlings were observed. GA_3 of 1000 ppm for 24 hours reported highest germination percentage, survival percentage, germination energy, dry weight of shoot and root and shoot: root for *Schleichera oleosa* while root length, shoot length, number of leaves, collar diameter were significantly higher with GA_3 of 100 ppm for 24 hours treatment.

***Key words**: Dormancy, Dry weight, GA_3, Germination energy, Stratification, Survival percentage*

Introduction

Schleichera oleosa Lour also known as kosamara, lac tree, honey tree, gum lac tree, and macassar oil tree Mall and Tripathi (2017) is a multipurpose tree species which provides a source of income to farmers in many Indian states through the cultivation of lac (as non-timber forest products), fruit, fodder, fuelwood, timber, and medicine for humans and livestock (Guleria and Vaidya (2015); Sarkar *et al.* (2017); Sarkar *et al.* (2018); Sarkar *et al*., (2021). *Schleichera oleosa* is a medium-sized to huge, slow-growing tree that can attain a height of 40 metres (Luna, 1996). It can be found in Jharkand, Bihar, Chattisgarh, Orissa, Madhya Pradesh, and Andhra Pradesh in India (Saha, 2013); Sarkar *et al*. (2021). In dry and mixed deciduous forest, the tree grows unevenly, occasionally openly and it thrives in a variety of soil conditions (Sarkar *et al.*, 2021). Flowers are light yellow or light green in colour (Sharma *et al.*, 2016). Fruits are 15 mm long and oval to sub globular in shape (Jannat *et al.*, 2016; Kundu and Chaturvedi, 2019). Flowering and fruiting take place from March to November (Tanjina Hasnat *et al.*, 2014; Sarkar *et al.*, 2021). Kusum wood is extremely hard and durable, and is used for oil and sugar mill rollers, rice ponders, and agricultural implements, whereas ripe fruit is eaten raw, leaves and twigs are lopped for cattle fodder, and oil is used to treat skin problems (Jannat *et al.*, 2016; Kundu and Chaturvedi, 2019).

However, forest fragmentation, deforestation, Jhum cultivation and other factors are causing the species to decline at an alarming rate (Jannat *et al.*, 2016). Kusum plantations are mostly developed from seeds in the wild, although artificially producing seedlings from its seeds necessitates some pre-sowing procedures (Siahaan, 2017); Sarkar *et al.*, 2021). Kusum seed germination and seedling growth are poor in natural conditions (Saha, 2013), as the seed exhibits physical and physiological dormancy (Kundu and Chaturvedi, 2019). Some pre-sowing treatments are required to break seed dormancy and increase germination rate (Zlesak, 2006; Pipino *et al.*, 2011). Hence in view of the above, present investigation has been planned to study the effect of pre-sowing treatments on seeds in order to break the seed dormancy to increase the germination rate and standardize some pre-sowing treatments for growing *Schleichera oleosa*

Materials and Methods

The present study was carried out in the nursery of the Department of Silviculture and Agroforestry, Forest College and Research Institute, Mulugu, Siddipet, Telangana. Seeds were sown in the nursery beds of size 10 m x 1 m which were prepared well before sowing the seeds using soil, sand and FYM in the ratio of 2:1:1.

Experimental design and treatment details

A completely randomized block (CRD) design with three replicates was adopted for the experiment. 30 seeds per replication was used. Hence, a total of 810 seeds were subjected to nine different pre-sowing treatments. Treatments used in the experiment are

T1 - GA3 of 100 ppm for 24hrs, T2 - GA3 of 300 ppm for 24 hrs, T3 - GA3 of 500 ppm for 24 hrs, T4 - GA3 of 1000 ppm for 24 hrs, T5 - 25% Sulphuric acid for 3 min, T6 - 25% Sulphuric acid for 5 min, T7 - 25% Sulphuric acid for 10 min, T8 - Cold stratification @ 4 ^{o}C for 48 hrs, T9 – Control.

Observations recorded

Germination period (Days)
Germination energy
Germination percent
Survival percentage
Root length (cm)
Shoot length (cm)
Collar diameter (cm)
No. of leaves per seedling
Shoot to root ratio
Dry weight of shoot (Gm)
Dry weight of root (Gm)

Results

Germination parameters

The results of the present study clearly showed that germination attributes were significantly influenced by different pre-sowing treatments excluding survival percentage. The highest germination percentage (66.6 %) was recorded in T_4 GA_3 of 1000 ppm for 24 hours and the lowest germination percentage (30 %) was recorded in T_6 25% sulphuric acid for 5 min than control. The highest survival percentage (90 %) was recorded in T_4 GA_3 of 1000 ppm for 24 hours whereas the lowest survival percentage was re-

Table 1. Influence of different pre-sowing treatments on Germination parameters of *Schleicheraoleosa*

Treatment	Germination percentage (%)	Survival percentage (%)	Germination energy (%)	Germination period (No of days)
T1	53.33	83.3	46.6	25
T2	43.33	74.35	33.3	27
T3	40	77.77	34.4	27
T4	66.66	90	50	22
T5	50	86.66	36	24
T6	30	88.88	20	19
T7	30	74.07	20.1	19
T8	30	66.66	30.2	21
T9	46.6	71.42	36	21
Sem ±	0.487	0.499	0.745	0.77
CD @ 5%	1.457	NS	2.305	2.305

Significance level @ 5 % NS – Non-Significant

corded in T_8 (66.6 %) cold stratification @ 4 °C for 48 hrs. T_4 GA_3 of 1000 ppm for 24 hours recorded highest germination energy of (50 %) which followed by T_1 GA_3 of 100 ppm for 24 hours (46.6 %), T_5 25 % sulphuric acid for 3 min (36 %). The lowest was observed in T_6 25% sulphuric acid for 5 min (20%). Longer germination period was observed in both T_2 $GA_3$of 300 ppm for 24hrs and T_3 GA_3 of 500 ppm for 24 hrs (27 days) while shorter was recorded in T_6 25% Sulphuric acid for 5 min.

Growth parameters

Growth parameters like root length, shoot length, number of leaves, collar diameter was recorded after 45 days and 90 days while dry weight of shoot & root, shoot: root ratio were recorded after 90 days. Each aforementioned parameter increased significantly with increase in number of days. Maximum root length was seen (16.5 cm) in T_1 GA_3 of 100 ppm for 24 hours and lowest was recorded in T_6 25% sulphuric acid for 5 min (10.1 cm). Maximum shoot length (15.3 cm) was observed in T_1 GA_3 of 100 ppm for 24 hours while the lowest was recorded in T_6 25% sulphuric acid for 5 min (8.7 cm). GA_3 of 100 ppm for 24 hours (T_1) resulted maximum collar diameter (2.2 cm) and number of leaves ((15) and control recorded lowest collar diameter with 0.86 cm whereas T_6 25% sulphuric acid for 5 min (5) recorded lowest number of leaves. In case of dry weight of shoot and root highest was recorded in T_4 GA_3 of 1000 ppm for 24 hours (2.4 and 0.71g) and lowest dry weight of shoot was observed in T_2 $GA_3$of 300 ppm for 24 hrs (0.57 g). And T_8 cold stratification @ 4 °C for 48 hrs (0.25 gm) recorded lowest dry weight of root. T_4GA_3 of 1000 ppm for 24 hours recorded highest shoot: root (1.81) and lowest was observed in control (1.18).

Discussion

Hemalatha and Chandari (2021) reported that maximum germination percentage (34.66%) was obtained when seeds are treated with GA_3 which are phytohormones that have multiple functions in the regulation of ontogenesis, influencing germination and controlling seed and fruit development. Motisingh *et al.* (1989) have reported that survival percentage ranged from 87 to 94 per cent in GA3 treatments. Solimon and Mohammed (2013) reported that shorter germination period was recorded when seeds are treated with Sulphuric acid. Maharana *et al.* (2018) stated that when the seeds of *Gmelina arborea* treated with GA_3 200 ppm found germination energy (35.83) significantly higher when compared to others. Work done by Thounaojam and Dhaduk (2020) on *Buchananialanzan* seeds stated that highest root length (9 cm) was obtained when treated with GA_3 @900 mg/l for 24 hrs treatment. Hemalatha and Chandari (2021) stated that 2.23 mm, collar diameter was measured in the *Santalum album* seeds which are treated with GA3.

Conclusion

Pre-sowing treatments significantly influenced the

Table 2. Influence of different pre-sowing treatments on growth parameters of *Schleicheraoleosa*

Treatments	Shoot length (cm)		Root length (cm)		Number of leaves		Collar diameter (cm)		Dry weight of shoot (gm)	Dry weight of root (gm)	Shoot: Root
	45 days	90 days	45 days	90 days	45 days	90 days	45 days	90 days			
T1	13.5	14.3	14.5	16.5	9.16	11.3	1.68	2	1.44	0.56	1.75
T2	11.6	12.6	12.6	14.6	8.5	10	1.16	1.3	0.56	0.27	1.7
T3	11.5	12.8	12.5	13.8	8.5	8.3	1.21	1.5	1.62	0.61	1.69
T4	12.5	14.1	13.9	15.8	8.8	10.6	0.8	1.36	1.85	0.71	1.81
T5	11.4	12.6	12.4	14.3	8.6	8	1.16	1.17	1.27	0.53	1.73
T6	7.16	8.7	8.1	10.1	8.35	7	0.65	1.35	0.71	0.4	1.7
T7	11.8	12.4	12.8	14.8	9	11	1.03	1.16	1.06	0.69	1.27
T8	12.9	13.5	13.6	16.0	8.8	8.3	1	1.1	0.96	0.25	1.71
T9	8.1	12.6	9.1	11.1	7.4	7.7	0.6	0.86	0.71	0.51	1.18
Sem ±	1.041	0.750	0.878	0.862	1.979	1.492	0.128	0.166	0.259	0.039	0.39
CD @ 5%	3.118	2.246	2.630	2.582	NS	4.466	0.383	0.498	0.776	0.118	NS

Significance level @ 5 % NS – Non-Significant

germination and growth of *Schleicheraoleosa*. It can be concluded that, the pre-sowing treatment with T_4 GA_3 of 1000 ppm for 24 hours to *Schleicheraoleosa* seeds has improved germination parameters while T_1 GA_3 of 100 ppm for 24 hours improved growth parameters. Hence it is advisable to treat the seeds of *Schleicheraoleosa* with T_4 GA_3 of 1000 ppm for 24 hours or T_1 GA_3 of 100 ppm for 24 hours for better germination and growth of the seedling.

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