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Effect of pre-treatments on germination of Latka (*Baccaurea sapida* Muell. Arg.)

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ABSTRACT

Latka (Baccaurea sapida)is an under-utilized fruit crop, native to South-east Asia, belongs to family Euphorbiaceae, having ethno-medicinal, social, religious and nutritional values. The plant is mostly propagated by seeds, which are recalcitrant in nature. In the present study various pre-sowing treatments were experimented for the propagation of the plants through seeds to determine the germination per cent, germination value and mean germination time. Seeds soaked in2% NaH_2PO_4 for 12 hours showed the highest germination per cent (87.00%); maximum germination value (10.18) and minimum mean germination time (21.11 days)followed by1% NaH_2PO_4 and 6% thiourea for 12 hours, that was exhibited equal germination per cent (85.00%) in both, with germination value was 9.69 and 9.55and mean germination time was 21.78 and 22.25 days, respectively. Hence, the above pre-treatments are recommended for the commercial propagation of this species with taking adequate care and handling operation because seeds are recalcitrant in nature.

***Keywords*:** Germination percent, germination value, latka, pre-sowing.

INTRODUCTION

Baccaurea sapida is an under-utilized fruit crop, native to South-east Asia, belongs to family Euphorbiaceae (Rahman *et al*., 2014) which is known as Burmese grape (in English), Latka (in Bengli), Khattaphal (in Hindi), Kusum (in Nepali), Amda (in Odia) and Sohramdieng (in Khasi).The generic name 'baccaurea' is derived from a Latin term referring to the golden-yellow fruit colour (Chakrabarty and Gangopadhyay, 1997). It is widely distributed in tropical moist forests and homestead gardens in entire Terai region of West Bengal (Bhowmick *et al*., 2016), eastern sub-Himalayan tract (Rymbai *et al*., 2016) from plains of Bihar to high lands of Arunachal Pradesh and in lower hilly areas of North-eastern states, Odisha and Andaman and Nicobar islands. The tree is tall, decorative, dioecious, shade-bearer and evergreen in nature. Flowering occurs in summer and fruits are matured during monsoon period and fruit bearing is cauliflory in nature (Bhowmick, 2011). The plant also shows mild biennial fruiting (Pal *et al*., 2008).

The whole plant including leaves, roots, fruits and seeds have ethno-medicinal importance and health benefits. The fruit is traditionally offered by locals in the Holy Chariot Procession of Lord Madan Mohanin Cooch Behar, West Bengal. The fruit rich in vitamin C, protein and Fe (Peter, 2007).The seeds of the plant are also used to shade orange colour in silk and cotton textiles, as an alternative to "annatto" dye (Raghavan and Ramjan, 2018).The fruit is used as an anti-inflammatory and pain killer and used for the treatment of injuries, rheumatoid arthritis, cellulitis, abscesses *etc.* (Lin *et al.*, 2003).The bark is also reported to be used for curing skin diseases in Manipur and Meghalaya (Singh *et al*., 2014; Momin *et al.,* 2016).

Application of various seed treatments, *viz.* scarification, stratification, soaking in cold water, application of growth regulators and other chemicals, are beneficial to break the dormancy and enhance the seed germination. Several experiments conducted by different researchers on various minor fruit crops by application of certain chemicals to improve the germination, such as *Mimusops elengi* (Dey *et al*., 2021); *Spondia*

spinnata (Dey *et. al*., 2016); *and Syzygium cumini* (Barman *et al*., 2015) respectively. But no standard methodology and practices are carried out on *Baccaurea sapida* for enhancing germination potential of seeds because of its short period of viability. In this regard, the current experiment was conducted to study the effect on the germination of *Baccaurea sapida* using different pre-treatments.

MATERIALS AND METHODS

The experiment was carried out in the Central nursery of Department of Forestry under Uttar Banga Krishi Viswavidyalaya, Cooch Behar in 2018-19. The experimental site is located at 43m above msl at $26^0$23' 45.8" N latitude and 89^0 23' 16.7" E longitude. Climate is subtropical humid with wider seasonal and diurnal temperature variation. The mean annual temperature varied, 21.84^0-33.51^0C with relative humidity, 64-98%. The mean annual rainfall of this location is 2300-2500mm which is concentrated in pre-monsoon and monsoon period.

After observing the physiological maturity visually, ripened fruits were collected from the nearby areas of the university. Seeds were de-pulped manually to remove seeds and dried under shade at room temperature for one day. The experiment was conducted with two factorial complete randomized block design.The primary factor was the chemicals used for enhancing the seed germination, having 11 levels including control, namely:T_1: control; T_2: cold water; T_3: 1% KNO_3; T_4: 2% KNO_3; T_5: 3% KNO_3; T_6: 1% NaH_2PO_4; T_7: 2% NaH_2PO_4; T_8: 3% NaH_2PO_4; T_9: 2% thiourea; T_{10}: 4% thiourea and T_{11}: 6% thiourea, comprising three replications with 100 seeds per replication. In other hand, soaking period was the secondary factor having 02 levels, namely: S_1: soaking for 12 hours and S_2: soaking for 24 hours. A total of 6,300 seeds were sown in polybags of 5''x7'' comprising well pulverized sand,soil and FYM (1:1:1 v/v) with adequate drainage facility. Weeding and watering was regularly done or as per need.

Observations on germination of seeds were recorded from the date of sowing up to one month and the parameters were documented as follows: Germination per cent (%) = (Number of seed germinated x Total number of seed $sown^{-1}$) x 100. Germination value (GV) was evaluated as per the method given by Czabator (1962). Mean Germination Time (MGT) was determined by MGT= "(Daily Germination x Days) x Number of seed $sown^{-1}$ (Un-germinated seeds at the end of the test were given values of n+1, where n is the number of days in the test) by following Bonner (1983) and Dey *et al.* (2021). One way ANOVA for each parameter was carried out by MS Excel 2019 and mean difference between the treatments was encountered by following Critical difference $(CD)_{P\leq 0.05}$ test. Angular transformation was carried out following the procedure as per Gomez and Gomez (1984).

RESULTS AND DISCUSSION

The effect of various pre-treatments with regards to germination percentage, germination value and mean germination time was recorded and a significant germination potential of seeds was found due to significant interaction between the chemicals and period of soaking (Table 1). A greater germination response was recorded in all the pre-treatments with germination per cent varied, 46.67-87.00%. Seeds soaked in 2% NaH_2PO_4 for 12 hours had significantly highest germination (87.00%) which was at par with 1% NaH_2PO_4and6% thiourea for 12 hours recording 85.00% germination in both.

It was observed that irrespective of chemical applied, seeds soaked for 12 hours had higher germination percentage (73.52%) than that soaked for 24 hours (67.03%). It might be due to the recalcitrant nature of the seeds (King and Roberts, 1979) and higher embryo-respiration (Zaghdani *et al*., 2000). Seeds soaked with cold water had 64.67% and 64.00% for 12 and 24 hours, respectively. Irrespective of soaking period, the germination percentage was showed decreasing trend from 81.67 to 60.00% with increasing concentration of KNO_3; whereas an increasing trend from 60.67 to 85.00% % with increasing concentration of thiourea while germination percentage showed increasing trend with increasing concentration and then declined in higher concentration of NaH_2PO_4. Seed size within species has also been shown to affect the percentage of seed germination.The present findings are in close alinement with the results of Kumar *et al*. (2003) and Dey (2011) in *Gmelina arborea.*

Table 1: Effects of pre-treatments on germination percentage (GP), germination value (GV) and mean germination time (MGT) in seeds of *Baccaurea sapida*

Pre- treatments	GP (%)	GV	MGT (Days)
Soaking period			
S_1:12 hours	73.52 (59.04)	7.36	23.27
S_2:24 hours	67.03 (54.97)	6.03	24.10
SEm±	**0.41**	**0.13**	**0.08**
C.D. (p=0.05)	**1.18**	**0.38**	**0.24**
Chemicals			
T_1: Control	46.67 (43.10)	2.84	26.06
T_2: Cold water	64.33 (53.34)	5.36	24.91
T_3: 1% KNO_3	79.33 (62.97)	8.42	22.71
T_4: 2% KNO_3	73.83 (59.24)	7.21	23.71
T_5: 3% KNO_3	63.50 (52.84)	5.33	24.43
T_6: 1% NaH_2PO_4	79.00 (62.74)	8.34	22.87
T_7: 2% NaH_2PO_4	81.00 (64.17)	8.88	21.80
T_8: 3% NaH_2PO_4	69.50 (56.49)	6.50	23.32
T_9: 2% thiourea	66.33 (54.54)	5.81	24.66
T_{10}: 4% thiourea	70.67 (57.22)	6.67	23.35
T_{11}: 6% thiourea	78.83 (62.62)	8.28	22.71
SEm±	**0.97**	**0.31**	**0.20**
C.D. (p=0.05)	**2.77**	**0.89**	**0.56**
Interaction			
T_1 S_1: Control	46.67 (43.10)	2.84	26.06
T_1 S_2: Control	46.67 (43.10)	2.84	26.06
T_2 S_1: soaking in cold water for 12 hours	64.67 (53.54)	5.43	25.24
T_2 S_2: soaking in cold water for 24 hours	64.00 (53.14)	5.28	24.58
T_3 S_1: soaking in 1% KNO_3 for 12 hours	81.67 (64.66)	8.96	22.55
T_3 S_2: soaking in 1% KNO_3 for 24 hours	77.00 (61.35)	7.87	22.86
T_4 S_1: soaking in 2% KNO_3 for 12 hours	74.67 (59.79)	7.44	23.09
T_4 S_2: soaking in 2% KNO_3 for 24 hours	73.00 (58.70)	6.97	24.34
T_5 S_1: soaking in 3% KNO_3 for 12 hours	67.00 (54.95)	5.91	24.12
T_5 S_2: soaking in 3% KNO_3 for 24 hours	60.00 (50.78)	4.76	24.74
T_6 S_1: soaking in 1% NaH_2PO_4 for 12 hours	85.00 (67.23)	9.69	21.78
T_6 S_2: soaking in 1% NaH_2PO_4 for 24 hours	73.00 (58.70)	6.99	23.96
T_7 S_1: soaking in 2% NaH_2PO_4 for 12 hours	87.00 (68.88)	10.18	21.11
T_7 S_2: soaking in 2% NaH_2PO_4 for 24 hours	75.00 (60.01)	7.57	22.49
T_8 S_1: soaking in 3% NaH_2PO_4 for 12 hours	72.00 (58.06)	7.00	22.85
T_8 S_2: soaking in 3% NaH_2PO_4 for 24 hours	67.00 (54.95)	6.00	23.79
T_9S_1: soaking in 2% thiourea for 12 hours	72.00 (58.06)	6.78	24.01
T_9 S_2: soaking in 2% thiourea for 24 hours	60.67 (51.17)	4.84	25.30
T_{10} S_1: soaking in 4% thiourea for 12 hours	73.00 (58.70)	7.16	22.90
T_{10} S_2: soaking in 4% thiourea for 24 hours	68.33 (55.76)	6.17	23.80
T_{11} S_1: soaking in 6% thioureafor 12 hours	85.00 (67.23)	9.55	22.25
T_{11} S_2: soaking in 6% thiourea for 24 hours	72.67 (58.49)	7.00	23.17
SEm±	**1.37**	**0.44**	**0.28**
C.D. (p=0.05)	**3.91**	**1.26**	**0.79**

Values in parentheses are arc-sine values.

Irrespective of the different chemical applied and period of soaking, the germination value was varied from 2.84 to 10.18. The mean maximum germination value (10.18) was noticed in seeds treated with 2% NaH_2PO_4 for 12 hours followed by 1% NaH_2PO_4 and 6% thiourea for 12 hours recording the value of 9.69 and 9.55, respectively while the minimum (2.84) was observed in control. The germination value was followed the same trend as germination percentage. Germination value indicates the seedling vigour that produced by the seed under study (Willan, 1985). The present experiment rigidly supports the statement that, seed sources having more germination of seed had more germination value. This finding is well in line with the results of Dey (2011) and Mutha *et al*. (2004).

The significant effects of various pre-treatments on mean germination time (days) were observed. The highest average (26.06 days) was observed in control whereas the lowest (21.11 days) was exhibited in 2% NaH_2PO_4 for 12 hours followed by 21.78 and 22.25 days was noticed when seeds soaked with1% NaH_2PO_4 and 6% thiourea for 12 hours, respectively. The present findings also support the statement that the better germination will evident with lesser time (MGT) for germination. This experiment could be elaborated that soaking seeds with 2% NaH_2PO_4 for 12 hours plays a great role in breaking of dormancy and greater physiological activity at a faster rate. The findings were similar with Roy *et al*. (2004) and Sherpa (2021) in *Pinus roxburghii* and *Michelia champaca,* respectively.

In the present study, seeds soaked with 2% NaH_2PO_4 for 12 hours showed higher germination per cent, germination value and lowest mean germination time followed by 1% NaH_2PO_4 for 12 hours and 6% thiourea for 12 hours, respectively. Moreover, seeds soaked for 12 hours had higher germination percentage and germination value than that soaked for 24 hours. Hence, the above said pre-treatments are recommended for the commercial seedling propagation of this species.

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