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Effect of seed treatments on plus trees of *Buchanania lanzan* in South-Eastern Rajasthan

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Abstract
The present investigation entitled "was carried out during April 2019 to October 2019 at College of Horticulture and Forestry Jhalawar. The experiment was laid out in Randomized Block Design (factorial) with twelve plus trees and three concentrations (0%, 2.5%, 5%). Out of twelve plus trees the Number of days for first seed germination recorded in PT1 and the highest germination percentage was observed in PT2 (56.30%). Minimum peak germination period (14.61days) and highest peak value (4.46 days) recorded in PT1. In case of concentration (H_2SO_4 5%), the Number of days for first seed germination was recorded earlier than other concentrations and the highest germination percentage (68.89 %) and survival percentage (90.30 %) were observed in PT1. Minimum peak germination period (10.00 days) and highest peak value (6.91 days) recorded in concentration (H_2SO_4 5%). Significantly increased the seedling growth attributes like seedling height, collar diameter and number of leaves (27.28 cm, 4.02 mm and 14.27) were observed in C_2 (Conc. H_2SO_4 5%). In case of twelve plus trees PT1 gave maximum seedling height (20.64 cm) and highest number of leaves (9.62), and maximum collar diameter observed in PT4 (3.33 mm).

Keywords: Genetic combining ability, Specific combining ability, Okra, Variance, Growth, Yield and Quality

Introduction
Chironji is small to medium sized nearly evergreen tree with a small crown and short trunk generally attaining a height up to 18 m and girth up to 1.5 m. Chironji (*Buchanania lanzan*) belong to the family Anacardiaceae. It bears flowering in the month of January-February and ripen in April-May. Chironji is an important fruit tree of agro-forestry and social forestry. Chironji adopts great significance due to its miscellaneous uses and ability to withstand adverse ecological conditions. In India, the distribution occurs in the state of Rajasthan, Chhattisgarh, Madhya Pradesh, Jharkhand, Gujarat, Odisha and also found in dry deciduous forests of India. Chironji is not cultivated as regular plantation. It is found growing as stray plantation in natural habitat. The oily kernels are the most important part and are used in preparation of puddings. The kernel is highly nutritious and rich in protein (25-30%) and yield sweet oil, which can be used to substitute olive and almond oil [4]. The fruit of Chironji is most important minor forest based product which is commonly used by local people and it also base of their income source. Fruit yield per plant is 13.20 kg during 9th year of orchard life under rainfed conditions of hot semi –arid ecosystem [8]. Mesocarp of fruit is edible by children [5]. Collection and selling of minor forest based produce; especially Chironji (one of the important multi-purpose forest species) brings income to the local inhabitants [6]. In India there is only 25% production of Chironji kernels against the requirement. Therefore, there is huge gap between productions of Chironji against demand [1]. Chironji seeds are recalcitrant in nature and it lose viability soon even after 3 months of harvesting. Such seeds may require special treatments like stratification, scarification, soaking in water, growth regulators etc., for overcoming dormancy. Pre-sowing treatment with chemicals like GA3, KNO_3 and thiourea improve the seed germination of Chironji [7].

Methods and Material
Site Location
The present investigation was carried out at College of Horticulture and Forestry, Jhalawar (Rajasthan), under the supervision of the Department of Forest Biology and Tree Improvement, College of Horticulture and Forestry, Jhalawar (Agriculture University, Kota) during April 2019 to October 2019. The experimental design was RBD (Randomise Block Design) factorial. The experiment was conducted with 12x3 factorial experiment where 12

plus trees and 3 concentrations of H_2SO_4 (0%, 2.5% and 5%) with three replications each. Nursery bed was prepared of a bed size of 20 x1 m and white polythene bags were filling with Soil, Sand and FYM in the ratio of 3:1:1. After pre sowing treatment, seeds were sown in polythene bags.

Seed preparation

First of all, medium size phenotypically superior trees were selected from different villages, namely Acharpura, Aamkho and Baith of shahbaad tehsil of Baran district of Rajasthan. At the time of the fruiting the mature fruits were collected from these trees in June (2018). Collected fruits were brought to the laboratory and stored it in refrigerator for nine months. In the month of the April it was soaked in normal water for three days and then after 3 days soaking, fruits were clean by hand, and then seeds were separated from detached pulp through proper washing. Then after seeds were treated with Conc. H_2SO_4 (0%, 2.5%, 5%) for 10 minutes and thereafter seeds were washed by hands in proper flow of water. The observations were recorded daily on germination parameters. The date of first plumule emergence was recorded and computing the difference between date of sowing and plumule emergence was recorded as a number of days taken for germination. The germination percentage was calculated by using below formula:

Germination percentage (%) = (Number of seed germinated / Number of seed sown) × 100.

The survival percentage of Chironji seedling was calculated at the end of the experiment (180 Days after sowing) using below formula:

Survival percentage (%) = (Number of seedling survived/ Number of seed germinated) × 100.

Experimental detail

The fruits of twelve plus trees from three different villages namely Acharpura, Aamkho and Baith of Shahbaad tehsil (Baran District), collected for the study of Seed and Seedling Attributes of *Buchnania lanzan* in South-Eastern Rajasthan. Details of treatments are given in Table1.

Table 1: Details of the different concentration of H_2SO_4 seed treatments

S. No.	Treatments	Treatment Detail
1.	T_0	Control
2.	T_1	H_2SO_4 (2.5%) for 10 minutes soaking.
3.	T_2	H_2SO_4 (5%) for 10 minutes soaking.

Result and discussion

Number of days for first germination: A perusal of data presented in the Table 2 revealed that plus trees had no significant effect on the first seed germination, but the sulphuric acid exhibited the significantly effect on the first seed germination. The interaction of plus trees and concentrations was significantly influenced the first seed germination. Minimum days were taken for first seed appears was 9.81 days with C_2 (5% H_2SO_4) as compared to 13.25 days with control. The interaction of plus trees and concentrations of H_2SO_4 was significantly influenced with first seed germination. The minimum days taken to first seed germination under PT1 (8.67 days) which was at par with $PT1C_2$, $PT2C_2$, $PT3C_2$, $PT6C_2$, $PT7C_2$, $PT10C_2$, $PT12C_2$ and maximum days were taken in $PT7C_0$ (14.00) respectively.

Table 2: The effect of sulphuric acid and plus tree on Number of days for first germination.

PLUS TREE	Concentration of H_2SO_4			MEAN
	C_0	C_1	C_2	
PT1	13.00	10.67	8.67	10.78
PT2	13.67	11.00	9.00	11.22
PT3	13.33	12.00	9.33	11.56
PT4	13.00	12.00	10.00	11.67
PT5	12.67	12.33	10.33	11.78
PT6	12.67	11.33	9.67	11.22
PT7	14.00	12.67	9.00	11.89
PT8	13.33	10.67	10.00	11.33
PT9	13.67	10.00	10.67	11.44
PT10	13.33	12.00	9.33	11.56
PT11	13.33	11.33	11.00	11.89
PT12	13.00	12.33	10.67	12.00
Mean	**13.25**	**11.53**	**9.81**	
Factors		**C.D. (<0.05)**	**SE(d)**	**SE(m)**
Plus tree		N/S	0.37	0.26
Conc. of H_2SO_4		0.37	0.19	0.13
Interaction		1.29	0.65	0.46

Seed germination percentage: A perusal of data presented in the Table 3 revealed that selected plus trees and sulphuric acid individually had significant effect on germination percentage, but the interaction was found no significant. Among the plus trees PT2 had maximum germination percentage 56.30% and minimum with PT12 i.e. 44.44% but it was found at par with PT1 i.e. 54.82 %. Among the different concentration of H_2SO_4, the maximum germination percentage was observed in C_2 i.e. 5% H_2SO_4 with 62.56 % and the minimum germination percentage was registered in C_0 i.e.36.11%. The seed germination in chironji is erratic due to the possession of various degrees of physical dormancy caused due to hard seed coat, which is impermeable of water and oxygen [2]. Joshi *et al*. (2017) [3] reported that 64.13 per cent seed germination percentage of *Buchanania lanzan* when seeds were treated with H_2SO_4 at 5 per cent concentration.

Peak germination period (days): Data presented Table 3 reveals that plus trees and sulphuric acid individually had significant effect on peak germination period among the plus trees PT2 had shorter peak germination period 14.56 days which was at par with PT1 (14.61 days) and PT9 (14.94 days). The longer peak germination period was observed in PT12 17.44 days. Among the different concentration of H_2SO_4, the shorter peak germination period was observed in C_2 i.e. 12.61 days and the longer peak germination period was recorded in C_0 18.61 days. The interaction of plus trees and concentration was significantly influence with peak germination period. The peak germination period was shorter in $PT1C_2$ (10.00 days) and the longer period was recorded in $PT3C_0$ (20.00 days).

Peak value: A perusal of data presented in the Table 3 reveals that plus trees and conc. H_2SO_4 individually had significant effect on the peak value of germination. Among the plus trees, the maximum peak value of germination was observed in PT1 4.26 days which was at par with PT2 4.25 days and the minimum peak value of germination was recorded in PT12 2.66 days. Among the different concentrations of H_2SO_4, more peak value of germination recorded in C_2 (i.e. 5% H_2SO_4) 5.11 days. The lowest peak value of germination was recorded in C_0 1.95. The interaction of plus trees and sulphuric acid was found significant. The

peak value of germination was maximum in PT1C_2 (6.91) and the minimum value was attained in PT8C_0 (1.66).

Survival percentage: Data presented in the Table 3 exposes that plus trees and interaction of plus trees and sulphuric acid significantly not influenced the survival percentage, but the concentrations of H_2SO_4 significantly influenced survival percentage. The maximum survival percentage was obtained in PT2 (87.76%) and the minimum survival percentage observed in PT11 (80.30%). Among the concentration H_2SO_4, the highest survival percentage observed in concentration C_2 (88.57%). The lowest survival percentage was registered in C_0 (78.97%). In the interaction effect maximum survival percentage was recorded in PT1C_2 (90.30%). Whereas, minimum survival percentage was observed in PT10C_0 (70.00%).

Table 3: Effect of sulphuric acid and plus tree on seed germination percentage, peak germination period (days) and peak value

Plus trees	Germination %			Mean	Peak germination period			Mean	Peak value			Mean
	Conc. of H_2SO_4				Conc. of H_2SO_4				Conc. of H_2SO_4			
	C_0	C_1	C_2		C_0	C_1	C_2		C_0	C_1	C_2	
PT1	42.22	53.33	68.89	54.82	18.33	15.50	10.00	14.61	2.30	3.56	6.91	4.26
PT2	44.44	57.78	66.67	56.30	18.50	14.50	10.67	14.56	2.41	4.01	6.32	4.25
PT3	37.78	51.11	62.22	50.37	20.00	14.83	12.00	15.61	1.92	3.59	5.24	3.58
PT4	35.56	42.22	61.11	46.30	17.50	15.17	13.33	15.33	2.03	2.85	4.59	3.16
PT5	33.33	46.67	62.22	47.41	18.33	14.50	13.00	15.28	1.82	3.19	4.78	3.26
PT6	35.56	44.44	57.78	45.93	19.33	16.17	11.17	15.56	1.84	2.77	5.26	3.29
PT7	33.33	44.44	60.00	45.93	18.50	18.33	12.83	16.56	1.81	2.45	4.69	2.98
PT8	33.33	44.44	62.22	46.67	20.17	14.50	13.00	15.89	1.66	3.15	4.79	3.20
PT9	33.33	46.67	62.22	47.41	18.33	13.17	13.33	14.94	1.82	3.55	4.76	3.38
PT10	35.56	42.22	64.44	47.41	17.50	17.33	11.00	15.28	2.03	2.46	5.87	3.45
PT11	35.56	44.44	62.96	47.65	17.50	15.83	15.67	16.33	2.03	2.85	4.08	2.99
PT12	33.33	40.00	60.00	44.44	19.33	17.67	15.33	17.44	1.73	2.27	3.98	2.66
Mean	36.11	46.48	62.56		18.61	15.63	12.61		1.95	3.06	5.11	
Factors	C.D. (<0.05)	SE(d)	SE(m)		C.D. (<0.05)	SE(d)	SE(m)		C.D. (<0.05)	SE(d)	SE(m)	
Plus tree	5.73	2.86	2.03		1.66	0.83	0.59		0.55	0.27	0.19	
Conc. of H_2SO_4	2.86	1.43	1.01		0.83	0.42	0.29		0.27	0.14	0.10	
Interaction	N/S	4.96	3.51		2.88	1.44	1.02		0.95	0.48	0.34	

Table 4: The effect of sulphuric acid and plus tree on survival percentage

PLUS TREE	Concentration of H_2SO_4			MEAN
	C_0	C_1	C_2	
PT1	79.36	87.37	90.30	85.68
PT2	84.92	88.43	89.93	87.76
PT3	82.22	85.93	89.26	85.80
PT4	81.11	83.81	86.30	83.74
PT5	80.00	84.87	89.10	84.66
PT6	75.56	84.40	88.43	82.80
PT7	80.00	84.72	88.80	84.51
PT8	80.00	84.92	89.26	84.73
PT9	80.00	85.51	89.63	85.05
PT10	70.00	83.61	89.26	80.96
PT11	74.44	80.16	86.30	80.30
PT12	80.00	83.01	86.30	83.10
Mean	78.97	84.73	88.57	
Factors		C.D. (<0.05)	SE(d)	SE(m)
Plus tree		N/S	2.29	1.62
Conc. of H_2SO_4		2.29	1.14	0.81
Interaction		N/S	3.97	2.80

Conclusion

The present study concluded that among the twelve evaluated different plus trees, among the different plus trees, PT1 taken the minimum number of days for first seed germination and peak germination period (days) as well as peak value was higher in PT1. In case of seed germination and survival percentage, the maximum seed germination and survival percentage found in PT2. Therefore, PT1 and PT2 can be used for enhancing early seed germination, seed germination percentage and survival percentage of Chironji. Results also revealed that seeds of Chironji may be stored 9 months and 5% H_2SO_4 treatment for 10 minutes performed best germination percentage 68.89% as compared to 40.22% i.e. no treatment (control).

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