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EFFECT OF PRETREATMENT ON SEED GERMINATION AND SEEDLING GROWTH OF *TERMINALIA CHEBULA* RETZ

N. D. Khobragade[1] and Pooja Patel[2]
Forest Research Centre for Skill Development, Chhindwara, (M.P.)
[2]Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur (M.P.)

ABSTRACT:- The present study was undertaken to examine the effect of pretreatments on seed germination of *Terminalia chebula* Retz. Due to the hard seed coat with thick pericarp having high content of phenolic compounds, *T. chebula* seeds germinate irregularly taking longer time for nursery establishment. Germination parameters were significantly influenced by the pre sowing treatments and the water soaking of the seed. The data revealed that the Highest germination percentage (68%), mean daily germination (0.42), peak value of germination (0.41), germination value (0.67) and seedling vigour index (3536) were observed in seeds with removed pulp and soaking in water for 48 hrs (T4).

KEYWORDS: **-** Depulping, Pre-treatment, Germination, Seedling, Germination value,Vigour index and *Terminalia chebula*.

INTRODUCTION:-

Terminalia chebula Retz. commonly known as Harra having a trade name of chebulic myrobalans, belongs to family Combretaceae and is indigenous to India and South East Asia (Dymock *et al*., 1976). In India it is distributed throughout the greater part except arid zone (Troup, 1921). It is found in sub Himalayan tract from the Ravi eastward to West Bengal and Assam ascending up to an altitude of 1,600 m. It can grow in different environmental conditions. Soil supporting Harar vary widely in depth and composition. In its natural habitat, the mean maximum temperature varies from 37ºC to 48ºC, absolute minimum temperature from 1ºC to 15ºC and annual rainfall from 750 to3250 mm (Joshi and Narain, 1992 and Troup, 1921). It is found on variety of geological formations and on laterite, clayey as well as sandy soil. The species is a strong light demander, frost-hardy and drought resistant to a considerable extent. It also withstands fire and exhibits a remarkable recovery from scars and burns after fire. It coppices very well, the coppice-shoots being often very vigorous (Anonymous, 1976).

T. chebula is a moderate-sized to large deciduous tree with a rounded crown, spreading branches and usually a short trunk. Bark is dark brown, often longitudinally cracked, exfoliating in wood scales; leaves are ovate or elliptic with a pair of large glands at top of petiole. Drupes are 3-5 cm long, ellipsoidal, obovoid or ovoid; yellow to orange brown in colour and are sometimes tinged with red or black colour; become hard on ripening and are 5-ribbed on drying. Flowers are yellowish brown in terminal spikes (Troup, 1921). In north India, flowering of Harar commences from first week of May. Two flowering flushes have been observed, first beginning from May and second from August and ripening of fruits lasts till April (Singh *et al*., 2003).

In this tree, fruits are economically important part having medicinal properties and tannin content of commercial importance. On an average a mature tree yields 30 - 35 kg fruits. The number of seeds varies from 170 – 220 per kg and the cost of fruits is Rs 4 per kg (Verma, 2006). The fruit is used as an astringent and laxative, for local external application against chronic ulcers and an important constituent of "Triphala choorna". Leaves of the tree are used as green fodder and wood is a good timber (Anon., 1996). Powdered fruits are used as denitrifies and useful in carious teeth bleeding and ulceration of gums (Jain, 1994). Terminalia chebula called as "King of medicines" is listed in Ayurvedic material medica. Tannins of fruits such as Chebulagic acid, Chebulinc acid, tannic acid and Gallic acid belong to the hydrolysable groups are extensively used in different industries. Terminalia chebula has also shown cardio protective effect against the potent chemical,

isopreterenol .Recently, chebulagic acid from immature seeds of Terminalia chebula was found to suppress the onset and progression of collagen induced arthritis in mice. (Kumar *et al*., 2007). Due to shifting trend from allopathic to Ayurvedic medicines, the demand for its fruits has increased tremendously.

The germination of seed is poor due to hard mesocarp, thick shell and poor kernels. Poor natural regeneration and over exploitation of this species have lead to scarcity in its natural habitat (Sharma *et al*., 1995). Due to which it is already included in vulnerable category of IUCN red list.

Terminalia chebula is widely used for medicinal and other purposes in India. However, people are not interested in raising the seedlings of the species in nursery due to low germination percentage (around 50%) and more average time (up to 2-3 months) required for seed germination (Luna, 1996). Low germination percentage as well as long time requirement is believed due to the hard seed coat and thick fleshy pulp of fruits. Many evidences suggest that germination of seeds with hard seed coat is enhanced by seed pre-sowing treatments. If untreated, the drupes germinate slowly and irregularly. This delayed and irregular germination of seeds in the nursery is of a serious constraint for efficient nursery management and plantation establishment. Keeping this in view, the present investigation has been taken up.

MATERIALS AND METHODS:

The experiment was conducted during 2018-19 to study the seed germination and seedling growth of *Terminalia chebula*. Experiments were carried out at Forest Research Centre for Skill Development , Chhindwara .madhya Pradesh, India. Seeds were collected from Tamia and Delakhari ranges of Chhindwara district of Madhya Pradesh. 100 Seeds were randomly selected for each treatment viz. T0 – Control, T1 - Fruits were depulped but not soaked in water, T2 - Fruits were depulped and soaked in cold water for 12 hours, T3 - Fruits were depulped and soaked in cold water for 24 hours T4 - Fruits were depulped and soaked in cold water for 48 hours and T5 - Fruits were depulped and soaked in hot water (80°c to 100°c) for 2 min were immediately washed in cold water. The germination experiment was laid out in completely randomized design (CRD). The treatments were replicated thrice. Fully matured fruits were collected from the trees. The uniform sized bold seeds were chosen for the germination trial. After pre-treatment, seeds were sown in polybags containing soil : sand : fym (1:1:2 ratio). The number of seeds germinated in each day was counted; Emergence of plumule above the media was taken as the criterion of germination. The germination was recorded up to 60 days from the day of sowing. Based on daily germination count, the following parameters were computed. Germination percent, Mean daily germination (%), Peak value (PV) , Germination value, Shoot length (cm) , Root length (cm) and Seedling vigour index (SVI). The data collected on various parameters during the course of investigation were statistically analyzed using computer software Microsoft Excel to explore the possible variations in seed germination. For analysis of variance (ANOVA), OPSTAT software were used as described by Sheoran Programmer, Computer Section, CCS HAU, Hisar Germination percent : Germination of seeds in each treatment was recorded daily up to 60 days. The seeds were considered as germinated when the cotyledonary leaves emerged out of the soil (Guneyliet *et al*., 1969). From the daily germination count, percent seed germination was recorded.

Germination percentage = (Number of seeds germinated × 100)/ (Number of seeds sown)

Mean daily germination (%) = (Cumulative percent germination)/ (Total number of days)

Peak value (PV) = Maximum mean daily germination reached at any stage of germination period

Germination value = Mean daily germination X peak value by Czabator (1962).

Seedling vigour index was calculated by adopting the method suggested by Abdulbaki and Anderson (1973) and expressed as number.

RESULT AND DISCUSSION:

Germination parameters of the *T. chebula* seeds were significantly influenced by pre sowing treatments.

Highest germination percentage (68%), mean daily germination (0.42), peak value of germination (0.41), germination value (0.67) and seedling vigour index (3536) were observed for the seeds with removed pulp and soaking in water for 48 hrs (T4). The next highest germination was recorded for the seeds were depulped and soaked in hot water (80°c to 100°c) for 2 min were immediately washed in cold water. Although 24% seeds kept as control germinated (Table 1). Generally, the pre-sowing treatments improve the germination (Kumar *et al*., 2015a). The result of the present study were in the line of the findings of many other authors who mentioned that depulping of fruits and soaking of the seeds in cold water enhanced the seed germination of *T. bellirica* (Hossain *et al*., 2005b). and mentioned that depulped seeds soaked in the cold water for 48 h gave the maximum germination and seedling growth for both the species *T. bellirica* and *T. chebula*. Usually depulping the fruits allows seed coat for water penetration which makes the seed.

Seedling Growth : Data of seedling growth were also recorded after nine months of seed sowing, shoot length (cm) root length (cm) and collar diameter was recorded (Table-2). Results indicated that maximum shoot length, root length and collar diameter was attaining by the T-4 with 30.00 cm., 22.00 cm. and 6.00mm respectively followed by T-5, T-2 and T-3 while T0 showed minimum growth performance in shoot length root length and collar diameter i.e 19.00 cm. 15.00 cm. and 3.00 mm respectively.

Howard (1937) noticed that immersion of teak seed in hot water for 48 hours and placed in boiling water and allowing the whole thing to cool, induced higher germination in 24 hours. In a study on seed coat imposed dormancy in *Bauhinia racemosa* seeds, Prasad and Nautiyal (1996) reported that, soaking the seed in hot water and mechanical scarification gave better germination percentage. In a study to enhance germination Ma and Liu (1986) reported that seeds of different species of Pinus, Picea, Lrix, Conninghamia, Ptatychladus, hippophae and Vitex germinated better when they were previously soaked in water for 15 to 24 hours. Soaking for more than 24 hours was found to be detrimental to the germination of all species. In *Tephrosiza perpurea* reported that concentrated sulphuric acid treatment for three and four minute gave the highest germination with less mechanical injury and seed damage (Dharmalingam *et al*., 1973). For instance, Shivanna *et al*. (2007) reported 51% - 60% germination of *T. bellirica* seeds when the mesocarp was depleting. A germination success of up to 50% was obtained when clean seeds (removing the dry pulp) were sown at BFRI (Shivanna et al., 2007).

TABLE 1: RESPONSE TO VARIOUS PRETREATMENTS OF *TERMINALIA CHEBULA* SEEDS

PRETREATMENTS	GERMINATION %	MEAN DAILY GERMINATION	PEAK VALUE	GERMINATION VALUE	VIGOUR INDEX
T0	**24**	**0.15**	**2.41**	**0.35**	**816**
T1	**40**	**0.22**	**1.66**	**0.36**	**1560**
T2	**44**	**0.24**	**2.2**	**0.52**	**1716**
T3	**40**	**0.22**	**2.1**	**0.46**	**1840**
T4	**68**	**0.42**	**0.41**	**0.67**	**3536**
T5	**64**	**0.40**	**0.39**	**0.66**	**3072**
CD	**9.872**				
SE(M)	**3.039**				

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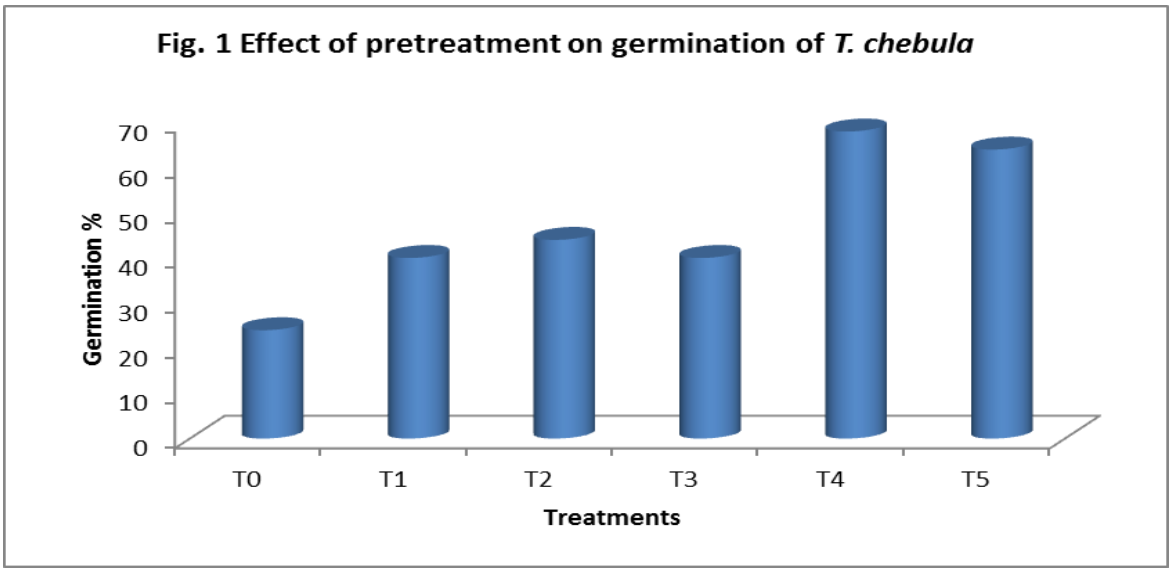
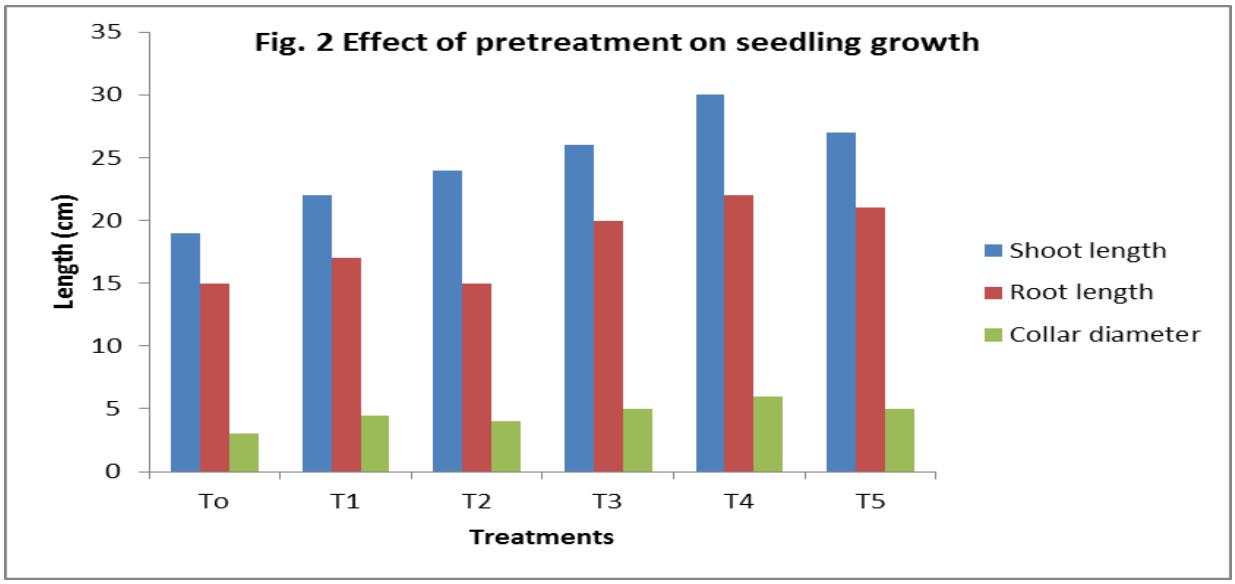


TABLE 2: AVERAGE SHOOT LENGTH, ROOT LENGTH AND COLLAR DIAMETER OF *T. CHEBULA* IN DIFFERENT TREATMENTS AFTER 3 MONTHS OF SEED SOWING

SL. NO.	TREATMENTS	MEAN SHOOT LENGTH (CM)	MEAN ROOT LENGTH (CM)	COLLAR DIAMETER (MM)
1	T0	19.00	15.00	3.00
2	T1	22.00	17.00	4.50
3	T2	24.00	15.00	4.00
4	T3	26.00	20.00	5.00
5	T4	30.00	22.00	6.00
6	T5	27.00	21.00	5.00
	CD	5.592	N/A	0.868
	SE(M)	1.795	1.972	0.272



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