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Influence of Pre-Soaking Treatment on Seed Germination, Rooting and Survival of Khirni (*Manilkara hexandra* Roxb) Seedling cv. Local

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ABSTRACT

The experiment was conducted at the Lal-baugh farm, Fruit research station, Department of Horticulture, Junagadh Agricultural University, Junagadh (Gujarat) during 2016. The experiment was laid out in Complete Randomized Design (CRD) with three repetitions and twelve pre-soaking treatments.The treatment of GA_3 200 mg/l, recorded significantly the minimum days taken to first germination (21.93 days) and higher percentage of germination (78.33%) and root length (24.01 cm) at 180 DAS. In case of fresh weight of root (0.79 g) at 180 DAS and dry weight of root (0.46 g) at 180 DAS, as well as higher survival percentage (78.33%).

Key words: *Khirni seed, Cow dung slurry, Gibberellic acid, KNO_3, Thiourea.*

INTRODUCTION

The botanical name of Khirni is *Manilkara hexandra* (Roxb) Dubard, and it belongs to the family Sapotaceae or Mahua-family (Plant family Sapotaceae consists of trees/shrubs with milky latex. It includes about 70 genera and 800 species. The characteristic feature of member of this family is presence of reddish brown hairs on the leaf undersides and other plant surfaces). The synonyms of specie is *Mimusops hexandra* Roxb.

The Khirni (*Manilkara hexandra* Roxb) is native of Central India and the Deccan peninsula. It is cultivated in greater part of India for ornamental and wild sown near villages, common in wastelands' and hedges, in plains, gregarious in patches in Saurashtra for its sweet edible fruits. Khirnis commonly grown in laterite soil. Wastelands can be utilized by growing Khirni.

Khirni or Rayan is a small to medium sized evergreen tree, with a spreading crown and straight massive bole. Bark is dark grey and deeply furrowed. The leaves are alternate, stiff, glabrous, shining dark green in colour and leathery. The leaves at the tip are usually roundish and narrowing towards the petiole. The flowers solitary white or pale yellow. Fruit ellipsoid 1.5 - 2.0 cm long. Seed 1or rarely 2, reddish brown and shining. Khirni is propagated commercially though seeds. Seeds are extracted from fresh fruit and sown in rainy season for raising the seedlings.

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Studies on seed viability further revealed that, Khirni seeds have tendency to lose viability quickly[4]. When compared to fresh seed, stored for one, three and six months showed, loss in germination to the extent of 12, 31 and 36%, respectively. Seed priming using GA_3 1000 ppm for 24 hrs. Restored germination significantly about 0, 17 and 23%. The uniform emergence and early vigour obtained due to priming, could be commercially exploited to obtained graft able size of seedling early, so nursery costs can be reduced[5]. Besides seed propagation is the cheapest and easiest method.

Khirni is used as a rootstock for sapota in India. One of the best of these fruits, is also one of the least known. The golden yellow berries Khirni or rayan that come for only a very short time in the month of May, just when the real heat of summer starts. The problem of poor germination of seeds, limited availability of rootstock plants, slow rate of growth of Khirni seedlings to attain the graftable size for approach method of grafting, which is commonly used, take longer time for the graft success. Use of plant growth regulators, in enhancing seed germination and seedling growth of numerous plant species is well known[22,21,15]. In addition synthetic chemicals, other naturally available bio-products or organics are known to contain vital plant growth substances, which enhance the growth and development of plant[3].

Plant growth regulators and some chemicals are widely used in increasing the seed germination percentage and for vigorous and healthy growth of seedlings. GA_3, KNO_3, and Thiourea are being used on a large scale for increasing seed germination, stimulating the growth of various parts of plants and enhancing the rate of elongation of young seedlings. For enhancing, the seed germination and growth of seedling we can use PGR's like GA_3, Ethrel, chemicals like KNO_3, Thiourea, and cow dung slurry.

MATERIAL AND METHODS

The present experiment was carried out at the Lal-baugh farm, Fruit research station, Department of Horticulture, Junagadh Agricultural University, Junagadh (Gujarat) during the year 2016-2017.The climate of South-Saurashtra region, where Junagadh Agricultural University, Junagadh is situated, is typically sub-tropical, characterized by fairly hot and dry summer. The monsoons are warm and moderately humid and winters are cold and dry. Junagadh is situated at $21´5^0$ N latitude and $70´5^0$ E longitudes with the altitude of 60 meters above mean sea level on the western side, at the foot hills of the mount 'Girnar'. Climate is typically subtropical, characterized by fairly cool and dry winter, hot and dry summer and warm and moderately humid monsoon. The rainy season commences by third week of June and ends in September. July and August are the months of heavy precipitation. Average rainfall of this area is 848.4 mm. Partial failure of monsoon once in three to four years is common in this region. Winter sets in the month of November and continues till the month of February. December and January are the coldest months of winter. Summer commence in the second fortnight of February and ends in the middle of June. April and May are the hottest months.

The experiment was laid out in Complete Randomized Design (CRD) with three repetitions. In all, there were twelve pre-soaking treatments, control (T_1), water soaking (T_2), Cow-dung Slurry(T_3), GA_3 150 mg/l(T_4), GA_3 200 mg/l (T_5), GA_3 250 mg/l (T_6), KNO_3 0.5 % (T_7), KNO_3 1.0 %(T_8), KNO_3 1.5 % (T_9), Thiourea 0.5 %(T_{10}),Thiourea 1.0 %(T_{11}), Thiourea 1.5 %(T_{12}).

RESULTS AND DISCUSSION

The experiment findings obtained from the present study have been discussed here in following major heads.

Days to first germination:

Data presented (Table-1), showed significant differences on Days to first germination. It is clear from the results that, treatment T_5, GA_3 200 mg/l, recorded the minimum days to take germination 21.93 days. The number of normal seedlings was highest with treatment T_5, GA_3 200mg/l, because the highest

germination percentage was found with GA_3 200 mg/l. Days to first germination was highest with the treatment T_5GA_3 200 mg/l. Similar findings on germination enhancement in papaya due to GA_3 treatment was reported by Meena *et al.*,[13], Rajamanickam, C. and Anbu[17] in Aonla and Rangpur lime[16].

Germination percentage:

The data presented (Table-1) indicates significant difference on germination percentage. Significantly the highest germination percentage was recorded under the treatment T_5GA_3 200mg/l 78.33 %, followed by $T_4GA_3$150 mg/l 76.67 %. Induction of early germination under the treatments of GA_3 is well documented by various authors. They have stated that, GA_3 and chemicals are reported to increase the activities of hydrolyzing enzyme and alpha-amylase, at initial stage of germination and thus facilitated the germination process. These result are in agreement with the finding of in Rangpur lime,[7] we well as[10,14,20,8,12].

Even under the most favorable condition, the seed germination did not attained, due to the internal factors *viz*, physiological or biochemical factors. The use of growth substances play a prime role in order to overcome causes, controlled by chemical or physiological factors, which has been emphasized by Chaudhary *et al*[8]. The remarkable effect of GA_3 on seed germination, especially in breaking seed dormancy has been well established by several workers in guava[6,20].

Result of present investigation, showed favorable response up to 200 ppm of GA_3 treatment for seed germination, but the higher dose of GA_3 might inhibit or suppressed the effect on germination process to some extent. These findings are in accordance with the result of in ber[12].

Survival percentage:

It is clear from the results (Table-1) that, significantly the highest survival percentage78.33 was recorded180 days under GA_3 200 mg/l, which remained at par with T_4, as compared to rest of the treatments. The mortality percentages were decreased. It has been observed that, application of certain plant growth regulators enhanced seedling survival percentage by decreasing mortality percentage. These findings are in agreement with the result obtained by Sable and Waskar[19] in Khirni and Papaya[9].

Table 1: Influence of pre-soaking treatment on seed germination and survival percentage of Khirni seedling cv. Local

Treatments	Days to first germination	Germination percentage	Survival percentage
T_1	28.37	50.67	53.33
T_2	27.23	51.67	61.67
T_3	24.40	71.67	71.67
T_4	22.93	76.67	76.67
T_5	21.93	78.33	78.33
T_6	23.67	74.33	71.67
T_7	26.87	66.67	65.00
T_8	26.50	67.67	71.67
T_9	26.90	65.00	63.33
T_{10}	25.17	68.67	71.67
T_{11}	25.03	70.00	73.33
T_{12}	26.60	66.67	68.33
S.Em. ±	0.32	1.28	1.60
CD at 5%	0.94	3.74	4.66
C.V. %	2.2	3.29	4.01

Root length (cm):

Data presented (Table-2), showed significant differences on the root length of seedling at 180 DAS. The length root was influence by various pre-soaking seed treatment. Maximum length of root 24.01 cm, was recorded with the treatment T_5GA_3 200 mg/l, at 180 days, as compared to other treatments except T_4. The

vigorous shoot growth due to GA_3 treatment, might have resulted into increase in production of photosynthates, their translocation through phloem to the root zone, might be responsible for increasing the radical length. These results are in confirmation with the finding of in Rangpur lime[8] in Sour orange[1] in Ber[12] in Khirni[23] and Papaya[2].

Fresh weight of root (g):

Data presented (Table-2), showed significant differences on fresh weight of root at 180 DAS. It is clear from the results that the treatment T_5 *i.e.*GA_3 200 mg/l, registered the maximum fresh weight of root 0.79 g at 180 days, followed by T_4. The increase in fresh weight of root with GA_3 application, seems to have resulted in mobilizing the water and nutrient transport at higher rate. This might be due to the primary cause of stem elongation. This result is confirmation with the findings of in Rangpur lime,[8] in Khirni[18] and Passion fruit.[11]

Dry weight of root (g):

It is clear from the results (Table-2) that, significantly the maximum dry weight of root 0.46 g, was recorded under the treatment GA_3 200gm/l, followed by the treatments T_4. The dry weight increased due to the higher accumulation of fresh weight in seedlings. As quick initial germination increased the fresh weight of seedling due to more seedlings height, simultaneously increased dry weight. These findings are in agreement with the result obtained by Chaudhary and Chakrawar[8] in Rangpur lime, in Mosambi[20] and Khirni[18].

Table 2: Influence of pre-soaking treatment on rooting of Khirni seedling cv. Local

Treatments	Root length (cm)	Fresh weight of root (g)	Dry weight of root (g)
T_1	12.01	0.31	0.17
T_2	13.58	0.34	0.18
T_3	21.38	0.71	0.39
T_4	23.09	0.77	0.44
T_5	24.01	0.79	0.46
T_6	21.71	0.73	0.41
T_7	17.90	0.60	0.33
T_8	20.04	0.62	0.35
T_9	17.37	0.58	0.30
T_{10}	19.05	0.66	0.36
T_{11}	19.48	0.69	0.38
T_{12}	19.15	0.64	0.32
S.Em. ±	0.32	0.02	0.01
CD at 5%	0.94	0.05	0.02
C.V. %	2.91	4.64	4.04

CONCLUSION

It can be concluded from the result obtained from the experiment that, seed treatment with Gibberellic acid 200 mg/l, to Khirni seed (24 hrs soaking) was found beneficial for days to first germination, germination percentage, root length, fresh weight of root and dry weight of root, as well as survival percentage.

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