CHAPTER - II
REVIEW OF LITERATURE

In general, coconut is propagated through seed nuts. Selection of seed nuts is of utmost importance in coconut as performance of new progeny can be evaluated only after several years of planting. Since coconut is cross-fertilized crop and it does not breed true, selection of seed nuts and raising of seedling is more difficult. Through a series of selection made at different stages, it is possible to eliminate poor quality seedling.

Researchers have revealed the different horticultural techniques for increasing crop production in large number of fruit crops. The use of different pre sowing treatments of coconut seed nut remained little or untouched due to less extension and carelessness of nurserymen.

An attempt is being made here to present a brief account of some previous studies related to the present investigation in coconut and other fruit crops under the following heads.

2.1. Effect of pre sowing treatment on germination, growth and survival percentage of coconut seedling.

2.1.1. Coconut (Cocos nucifera L.)

Edmondson (1941) reported that, 10 out of 15 coconuts were capable to develope after having floated up to 110 days in the sea.

Rao (1953) recommended that, seed nut should be soaked in water before sowing in nursery for higher germination and recovery of quality seedling.

Menon and Pandalia (1958) observed that, the soaking treatment was particularly effective when dry condition prevailed after planting the seed nut in the nursery. This however, might be an indication that the non-soaked nuts in the nursery had been insufficiently irrigated as compared to the soaked ones being completely saturated with water.

Kutty (1964) applied, pre-sowing treatment of coconut seed nuts of tall variety with micronutrients (MgSO₄ 11,500 ppm and 2,300 ppm; Na₂B₄O₇ 5,700 ppm and 11,500 ppm; CuSO₄ 5,500 ppm and 11,000 ppm; MnSO₄ 4,250 ppm and 8,500 ppm; FeSO₄ 3,750 ppm and 7,500 ppm; (NH₄)₆Mo₇O₄O₂₁ 50 ppm and 100 ppm and ZnSO₄ 6,500 ppm and 13,000 ppm) in two concentrations each case. The nutrients were injected into
the husk of the seed nuts through the tuft portion using a syringe before sowing. It may be interesting to observe that of all the treatments, the seed nut treated with Boron (11,500ppm) have germinated in 57 days compared to control (11-12week).

Fremond and Brinin (1966) noted that, the removal of a slice of the husk from the upper part of the nut at the distal end above the germinating eye has the advantage of facilitating the penetration of water in the nut and the early emergence of the sprout. Similar result was also observed by Kenman (1973), Arvindakshan et al. (1988) and Mandal (1991). However Child (1974) reported that, the removal of husk slice from the nut was useless and unnecessary refinement, which increased nursery cost. The statement was also supported by Harries (1981 b) particularly in the adequate irrigation or rainfall.

Thomas (1973) concluded that, the soaking of coconut seed nut in water for a period of 15 days before sowing recorded the lowest period of germination (81.1days) as compared to (142.9 days) for untreated nut.

Hadas and Russor (1974) reported that in general, the water soaking, which enhances the germination of nuts, may be due to the higher quantum of water required for the initial imbibitions of water by a bigger nut like that palmyrah and coconut. Similar trends were also seen by Srivastava (1975), Yaklich and Orzolak (1977) and Harries (1981 b).

Silva and Alputharajah (1977) reported that, there was no significant effect on hastening germination by applied nutrient solution in husk by injection.

Thomas (1978) concluded that, horizontal planting of seed nut resulted in quicker germination and greater growth of seedling.

John and Fernanded (1979) observed that, some kind of soaked seeds removed water soluble substances from pericarp, so improved germination percentage.

Harries (1981 a) observed that, Tanzanian Tall variety of coconut shows two quite distinct sets of results. The Tanzanian Tall may therefore be regarded as a Niukafa type (Tall variety). The more rapid germination was observed in this variety by the water treatment.

Harries (1981 b) studied that, less amount of dilute salt solution which showed negligible effect while much quantities of stronger solution (i.e. sea water) might have delay germination. Soaking in plain water seems to be the only beneficial treatment. He further studied that the only beneficial effect of soaking coconut seed nuts which might be accounted for in terms of water potentials. The liquid inside coconut of
all age has osmotic potentials of about 2 bars, whereas, the hydrostatic pressure within the nut cavity ranges from 5-bar in the young fruit which decreasing with age, until fully ripe when there is a gas phase somewhat below atmospheric pressure.

Sufeliffe (1981) noted that, metric potential may be greatest in the husk. This frames proportionally larger part of the young fruit and with age becomes gradually cut off from the water in the nut cavity by increasing impermeability of developing shell of the nut. In a ripe fruit the water in the nut cavity would tend to migrate to the husk, because of the metric potential. The very long storage could result in the moist endosperm converted to copra inside the shell (Ball copra). Soaking of seed nut in water, after harvesting or storage would bring the matric potential to zero. Water could then migrate into the nut primarily through the soft eye in the proximity of the embryo. Germination process might be triggered immediately or when the negative osmotic potential of the nut water is raised to zero. Similar finding were also noted by Harries (1981 b).

Sadashivaih (1983) concluded that, 2-4 D, Urea and GA3 promoted seed nut germination which is applied into the seed nut by injecting technique.

Ohler (1984) noted that, improving the germination of seed nuts has also been tried by soaking the nuts in water or in chemical solution. Soaking of the nuts in water for a period of about two weeks has been recommended to improve sprouting or germination of the nuts and increase the number of roots. Soaking of the nuts for the periods longer than two weeks affects the germination of the nuts. Similar trend was also previously seen by Thomas (1973) at Tanzania in Tall variety of coconut.

Bose (1992) reported that, the many pre-sowing treatments recommended for reducing the period of germination with higher germination percentage, but the soaking the seed nuts in water for two weeks period has been found to be very effective.

Mandal (1998) reported that, the horizontal planting of coconut seed nut was advantageous as it gave highest percentage of early germination, produces vigorous seedling with good girth at the collar region; because the endosperm (nut water) remains close to the embryo.

Chattopadhyay et al. (2004) observed that, for better germination percentage and distant transportation, the seed nut should be sowing vertically in full buried condition because the author reported that higher but non-significant germination
percentage was recorded in horizontal planting (82.69 %) as compared to vertical sowing (79.94 %).

Marimuthu and Natarajan (2005) observed that, to get more quality seedlings, seed nuts are to be cured for one month in open shade, followed by sand for 2-3 months.

Peter and Kurian (2007) recommended storage of seed nuts in shade for a minimum period of 60 days prior to sowing in tall cultivars and 15-30 days in dwarf cultivars.

Thomas (2008) noted that, if the nut water is less in the seed nut horizontal planting is advisable.

Nagar et al. (2013) reported that, the Fifteen days rest after harvesting (R2) was found better with respect to earliness in germination, with higher percentage of germination and growth with maximum height of seedling and number of leaves. Whereas in per-sowing treatment, seed nut soaked in water for 15 days with punching was superior in early germination and growth of seedling.

2.1.2. Passion fruit (*Passiflora edulis* SIMS)

Gurung et al. (2014) studied the effect of chemicals and growth regulation on germination, vigour and growth of passion fruit (*Passiflora edulis* SIMS). The results showed significant differences among the treatments. Maximum germination percentage (84%) and germination index (2.02), was observed in seeds treated with Thiourea 1 per cent. Maximum seedling height and number of leaves, Vigour Index-I, Vigour index-II, the maximum fresh and dry weights of shoot were observed in seeds treated with GA3 500 ppm at 30, 60 and 90 days respectively.

2.1.3. Haritaki, Harda (*Terminalia chebula* L.)

Hossain et al. (2005) revealed that, the pre-sowing treatment de-pulped and cold water soaking of the Horitaki (*Terminalia chebula*) seeds, increase to six pre sowing treatment in which the highest germination percentage (66%) shoot length, root length, collar diameter and number of leaf were observed in the fruit de-pulped and soaked in cold water for 48 hours, followed by 60 percent in the de-pulped seeds soaked in cold water for 24 hours. The lowest germination percentage (48.9%) was obtained from control.

Sumbali et al. (2012) revealed that, in general, depulping the fruits, soaking in cow dung slurry for various periods and in particular alternative soaking,
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drying and soaking in cow dung slurry for 24, 8 and 24 hours respectively, had significantly enhanced seed germination and seedling growth. Seed germination started 26 days after sowing and continued up to 90 days.

2.1.4. Persian Lilak tree (*Melia azedarach* L.)

Azad *et al*. (2010) reported that, the germination rates of pre-sowing treated seeds were significantly increased compared to those in control, except for cold water treatment. The highest germination success (80%) was found in scarification with sand paper, followed by 74% and 69% in immersion in H$_2$SO$_4$ and hot water treatment, respectively in *Melia azedarach*.

2.1.5. Earpod wattle (*Acacia auriculiformis* L.)

Azad *et al*. (2011) reported that, pre-sowing treatments influences the germination rates of seeds that significantly increase the percentage germination compared with those in control (43%) and cold water treatment (52%). The highest germination success rate was found 83% in hot water treatment, followed by 78% in scarification with sand paper, and 75% with immersion in H$_2$SO$_4$.

2.1.6. Mango (*Mangifera indica* L.)

Teotia and Singh (1971) revealed that, the open jar storage treatment for 10 days after extraction of pulp gave significantly highest germination percentage (85%), over stones stored in leaf media (65%), charcoal powder (65%) and polythene bags (45%) storage.

Chandra (1980) observed that, mango cultivars Desi and Dashehari were germinated 100% at 0 and 30 days after harvest and it declined to 66% at 45 days after harvest.

2.1.7. Papaya (*Carica papaya* L.)

Arunugam and Shanmugavelu (1975) revealed that papaya seeds had maximum seed germination (94 %), when the seeds were treated with 100 ppm thiourea and 92 % with 200 ppm thiourea for 16 hrs.

Lima *et al*. (1985) recorded that, the seeds stored for 33 days in sand medium at room temperature shows, highest germination percentage in papaya cv. Maradol Roja.

Anburani and Shakila (2010) studied the influence of seed treatment on the seedling growth of papaya and revealed that, seeds soaked in GA3 200 ppm for 12
hrs recorded the maximum root length (8.4 cm), shoot length (14.9 cm) and vigour index (1826) followed by seed treatment with thiourea 2000 ppm for 12 hrs.

2.1.8. Citrus (*Citrus reticulata* L.)

Chaudhari and Chakrawar (1981) found increased germination percentage in Kagzi lime seeds, when treated with Thiourea 1500 or 2000 ppm.

Chaudhary and Chakrawar (1982 a), treated the Rangpur lime seeds with Thiourea 1000, 1500 and 2000 ppm solution, and observed fresh and dry weight increased in all treatments as compared to control.

Chaudhary and Chakrawar (1982 b), treated Rangpur lime seeds with Thiourea 1000, 1500, and 2000 ppm solution. No striking effects were observed in seedling height and number of leaves but number of branches increased considerably.

Kadam *et al.* (1994), studied the effect of various storage condition and storage periods on viability and germination percentage of Rangpur lime seeds. Viability and germination percentage was significantly affected by different storage conditions. After fifth week of storage, maximum viability and germination percentage was recorded when seeds stored at room temperature, followed by seeds sealed in polythene bags and stored at 90% relative humidity, at room temperature.

Saipari *et al.* (1998) reported that, maximum germination (79% and 77%), maximum length of tap root (22 cm and 19 cm), maximum number of secondary roots (58 and 60) and maximum number of leaves per plant (19 and 16), were noted in fresh seeds over air dried seeds for 24 hrs at 27±2°C and seeds dried for 1 week in silica gel in Karna khatta and Jatti khatti.

Sharma *et al.* (1999) found that, germination percentage of Kagzi lime seeds increased with seed treatment of thiourea 1000 ppm.

Doijode (2003) noted that, the fresh seeds exhibited high seedling vigour as compared to 30 days old stored seeds of Mandarin.

2.1.9. Aonla (*Emblica officinalis* L.)

Dhankar (1993) found that, Thiourea 250 ppm imparted maximum seedling height of Aonla over control.

Dhankar and Singh (1996), reported maximum number of roots in Aonla at 35 days after sowing with Thiourea 750 ppm treatment.

Gholap *et al.* (2000), studied the effect of plant growth regulators on seedling growth of aonla and revealed that, 200 ppm GA3 was found significantly
superior with respect to seedling height (27.63 cm), stem girth of seedlings (0.86 cm) and number of roots per seedlings (24.00), followed by thiourea 200 ppm.

Rashmi et al. (2007) revealed that, the increased height of seedling might be due stimulatory effect of thiourea. In aonla, may be possible due to stimulus of immediate cell progeny may be due to greater cell division and elongation of stem, portion and greater intermodal length, ultimately resulting in increase in plant height, number of leaves and girth, under the seed treated with 500 ppm thiourea over control.

2.1.10. Jackfruit (Artocarpus heterophyllus L.)

Krishnaswamy (1990) reported that, seeds of jackfruit when stored in plastic tray and kept in room temperature for shade drying for 9 days gave 100% germination.

Chiesotsu et al. (1995), observed highest germination percentage, percentage of survivability in field, height and diameter of seedling and minimum days taken for germination in fresh seeds, over stored seeds for 15 days in jackfruit.

Warrier et al. (2009) reported that, seeds stored under ambient condition (25±2°C), were most effective to increase germination percentage for 1 week of storage over 20°C, 15°C and 0±2°C temperature in Artocarpus heterophyllus L.

2.1.11. Palmyrah Palm (Borassus flabellifer L.)

Daniel (1992) observed that, the soaking of palmyrah palm seed nut in water for three hours, increases the germination and number of roots by 24.5 per cent as compared to un-soaked.

Das (2003), applied pre-treatment of palmyrah nuts with cow-dung slurry for 7-10 days in earthen pit. Then these nuts were removed from the pit and cleaned in water and then dibbled in the field. Within a period of 2 to 3 months, the palmyrah nuts start germination. The rate of success was found not less than 65 percent and this method is full-proof and the success is assured.

2.1.12. Ber (Zizyphus mauritiana Lamk)

Bhambota and Singh (1971) revealed that, less time required for germination, maximum germination percentage, height and girth of seedling were found, when seeds sown after soaking in water for 24 hrs over seeds sown as such.

Singhrot and Makhija (1979) revealed that, water soaking treatment for 48 hrs gave earliness in days taken to 50 percent germination (17.60 days), minimum
days for completion of germination (28 days) and increase in overall germination percent (83.60%) over concentrated sulphuric acid treatment for 3 minutes (17.80 days, 29.40 days and 79.20%), respectively in Ber.

Krishnan and Kulasekar (1984) found that, soaking of Ber seeds in Thiourea 500 ppm for 12 hrs improved the seed germination and seedling growth. Similarly, Murthy and Reddy (1990) reported that, soaking Ber seeds for 24 hours in 1000 ppm Thiourea solution at 30°C increased germination percentage and seedling growth.

Ghosh and Sen (1988) studied that, maximum germination percentage, basal girth and leaf number were found when seeds treated with KNO₃ 1% over GA₃ (100 ppm) after 30 days of storage. While, maximum germination percentage, seedling height, basal girth and leaf number, when seeds treated with 1% KNO₃ over thiourea and control treatment at seeds stored for 203 days in ber.

Murthy and Reddy (1989), studied the kernels of Jujube cv. Umran, when dipped in Thiourea (500 to 1000 ppm), GA₃ (100 or 200 ppm), benzyladenin (50 or 100 ppm) or KNO₃ (500 to 1000 ppm) for 24 hours and they found that Thiourea 500 ppm treatment gave significantly higher germination percentage (67.00), as compared with rest of the treatments.

Chattopadhay and Dey (1992) revealed that, seeds soaked in water for 48 hrs gave maximum germination percentage, when seeds sown in June over control and sulphuric acid soaking treatment in Ber.

Hore and Sen (1994) recorded that, the pre-sowing treatment of Ber seeds with thiourea 1 percent causes earlier seed germination with 8.1 days after sowing, as against 12.8 days required in untreated seeds to start germination.

Mankar et al. (1997) stated that, soaking extracted seeds for 24 hrs in water promoted early germination, good vegetative growth and higher percentage of germination compared with control.

Singh et al. (2001) conducted field experiment and reported that, ber seeds when soaked in water for 48 hrs + 4 days in moist gunny bag, got less time taken to start germination, less time taken to complete germination, maximum germination percentage and maximum height of seedling, as compare to water soaking for 48 hrs, control and concentrated sulphuric acid soaking for 6 minutes.
2.1.13. Cardamom (*Elettaria cardamomum* L.)

Gururumthry and Hedge (1987) revealed that, the pre-sowing treatment of cardamom seeds with 25 per cent nitric acid and soaking them in water for 24 hours increases seed germination percentage compared to untreated control.

2.1.14. Sapota (*Manilkara achras*)

Srivastava *et al.* (1984) reported that, sapodilla seeds treated with 1 % thiourea had the maximum germination followed by 1 % KNO₃.

Pampanna and Sulikeri (1999) reported that, seeds soaked in water for 24 hrs shows significantly maximum shoot length (6.35 cm), root length (3.79 cm) and number of leaves (3.06) over unsoaked seeds (4.90 cm, 3.12 cm and 2.68, respectively) at 90 days after sowing in sapota.

2.1.15. Cherry (*Prunus avium* L.)

Centinbas and Koyuncu (2006) stated that the thiourea treatment improved the germination of *Prunus avium* L. seeds and the effect of thiourea on germination was significant. The highest germination rate was observed with 120 days stratification + 10,000ppm thiourea with seed coat and 100 days stratification + 10,000ppm thiourea for seed without coat.

2.1.16. Khirnee (*Manilkara hexandra* Roxb.)

Patel *et al.* (1996) revealed that, for better germination of Khirnee seeds, it should be soaked in thiourea 1 per cent for 6 hours or should be treated with dung slurry for 24 hours before sowing.

2.1.17. Custard apple (*Annona squamosa* L.)

Ratan *et al.* (1993) revealed that, the soaking of custard apple seeds in water for 24 hours resulted in highest germination (71%), followed by soaking for 36 hours (67%). There was 15 percent germination in control (dry seeds). Number of days taken for initiation of germination was minimum (16 days) with seeds soaked in water for 48 hours, whereas the velocity of germination was higher with 24 hours water treatment and lower with dry seeds. Seeds soaked in water for 24 hours recorded maximum seedling vigour and significantly differed with 48 hours treatment and control.
Ratan and Reddy (2004) reported that, custard apple seeds treated with GA$_3$ 400 ppm for 12 hrs, recorded the longer roots (12.23 cm), whereas maximum leaf area (93.33 cm$^2$) followed by thiourea 0.5%.

2.1.18. Nutmeg (*Myristica fragrans* Houtt.)

Khandekar *et al.* (2007) revealed that, the effect of pre-sowing treatment in nutmeg give the mean maximum germination (88.88%) was observed, in thiourea (500 ppm) treatment, which was significantly superior to the rest of the growth regulator treatments. The minimum germination (77.09%), was observed in thiourea (1000 ppm) treatment, which was lower than control.

2.1.19. Phoenix species

Singh and Bhargava (2009) reported that, pre-sowing treatment of *Phoenix dectylifera* and *P. sylvestris* seeds with different treatments in which seed soaking in water for 24 hours increase germination percentage, plant height, number of leaves and length of roots as compared to control.

2.1.20. Lettuce (*Lactuca sativa*)

Mayer and Poljakoff-Mayber (1958) reported that, thiourea causes maximal stimulation of germination at 20°C. The lettuce seeds were treated for first 24 hours with thiourea and then were transferred to water, 90 per cent germination being obtained as compared with 40 per cent in water control and 70-80 per cent for shorter and longer period in thiourea.

2.1.21. Guava (*Psidium guajava* L.)

Rodfrquez *et al.* (1986) stated that, highest seed germination was observed in guava when the seeds were soaked in water for 4 days.

Chandra and Govind (1990), studied the effect of gibberellic acid, thiourea, ethrel treatments on seed germination of guava and noticed that, seeds soaked in 3000 ppm GA$_3$ recorded highest germination (83.2%), followed by seeds soaked in water (80.1%).

2.1.22. Peach (*Prunus persia* L.)

Hundal and Khajura (1979) reported that, seeds of Khurmani and Sufeda cultivars of peach soaked in 5000 and 7000 ppm thiourea for 24 hrs, resulted in highest germination.
2.1.23. Forest tree species

Kundu et al. (1997) concluded that, the soaking of Alstonia scholaris seeds in distilled water for 24 hours and continuous hot water soaking at 50°C for 30 minutes, performed equally well registering two fold increase in germination.

Kalia et al. (2005) studied, the effect of mechanical scarification and hot water treatment before sowing of seeds of stylosanthes scabra. The result obtained showed that, mechanical scarification by rubbing with commercial thin sand paper for 5 minutes recorded highest germination percentage, followed by hot water treatment for 15 minutes.

Singh et al. (2005) reported that, the pre-sowing treatment of Pongamia glabra L. seeds with hot water (50°C) for 15 minutes, enhanced seed germination up to 94 to 98 per cent, over the control.

Butola et al. (2007) revealed that, pre-sowing treatment of thiourea to Hypericum perforatum L. seeds with medium concentration (100 µM) had better germination as compared to control.

Shukla et al. (2008) concluded that, in Tarai zone of West Bengal, proper and quicker germination of Terminalia arjuna can be ensured for better seedling development, when the seeds are heavily pinched or seed coat nearly removed and then dipped for one minute in concentrated sulphuric acid, washed and subsequently dipped in cold water for 12 hours.

Haider et al. (2014) revealed that, in general, germination percentage was significantly (p<0.05) influenced by pre-sowing treatments and highest germination percentage (80- 81), was obtained in cold water treatment for 24 hours and lowest (62%) was in control. The survival percentage of seedlings was highest (88%) at 2.0 m x 2.0 m spacing in the field and the average height was more than 2.0 m after 24 months of outplanting.

Hossain et al. (2014) revealed that, depulping of fruits and soaking the seeds significantly enhanced the seed germination and seedling growth performance in nursery condition. The fastest seed germination was observed in depulped seeds soaked in cold water for 72 h (DT3), and slowest germination was in intact fruits without treatment (IT0). The highest germination percentage (93), was observed in depulped seeds soaked in cold water for 48 h (DT2), followed by 85.6% in depulped seeds soaked in water for 24 h (DT1), which was significantly higher than the other treatments including the control (36.7).
Omokhua et al. (2015) revealed that, the seedlings subjected to treatment T3 had the highest mean leaf number of 22 while the seedlings subjected to T1 and T6 had same lowest leaf number of 18. It was observed in this study that coconut water (T3), significantly did better in terms of seedling growth and development, when used as a pre germination treatment for T. tetraperta seeds. However, the seeds when dipped in hot water for 1 minute (T2) as pre germination treatment did not significantly improve germination and growth of T. tetraperta seeds.

2.2. Vigour of seedling

Kutty (1955) reported that, the mature seed coconuts with and without cracks at stigmatic ends has shown, that the seed nuts without cracks were more vigorous than those obtained by with cracks.

Thomas (1974), studied the effect of certain physical and chemical treatments on the germination and subsequent growth of coconut seedlings. The result indicated that, all the treatments except the chopping of the ends significantly reduced the germination period and gave the higher percentage and greater growth of seedling as compared to control. Among all treatments, soaking in water for two-weeks was the best and it ranked first in all the characters. Similar result was also found by singh (1983) in ber seedling.

Silva and Atputharajah (1977) reported that, injection of micronutrient solution and water (control) into the husk was applied at the distal end of the nuts. The injected solutions contained about ten times more nutrient than total amount present in the kernel and nut water. The treatment of Zn, Cu, and control (water applied) could reduce the sprouting period and increased the sprouting percentage. The Cu treatment produced the highest percentage seedling, whereas the Zn and control had adverse effects on sprouting and height of seedling. Similar finding was also reported by Silva (1981).

Willatt and Stress (1979) reported that, the availability of sufficient water was essential for the imbibition of water in seeds, their germination and height of seedling. The rate of seed swelling, germination, root and shoot extension depends on the water potential of the soil and seed.

Sadashivaiah (1983) observed that, urea (2%) and potassium nitrate treated seed nut, showed higher seedling vigour as expressed morphological features such as early leaf splitting, number of leaves, height and higher girth at collar due to
early sprouting of seed nut. Arvindakshan et al. (1988) reported that, in coconut the removal of husk from coconut hastened the process of germination and also increased the girth at collar.

2.3. Quality seedling

Rao (1953) recommended that, seed nut should be soaked in water before sowing in nursery for higher germination and recovery of quality seedlings.

Aiyadural (1956) reported that, in coconut nursery practice, the seed nut without water should be rejected at the time of planting. But from the experiment it was seen that, to utilize the rejected nuts for producing seedling by soaking only those, which become heavy after the treatment, this was an important and useful hint to nursery men who produce quality seedling for coconut growers.

Markose and Kutty (1987) concluded that, physiologically matured seed nut, when sown in the nursery affects very much on the duration taken for germination, which ultimately influences the seedling size and vigor. They have also reported that, seed nuts should be fully matured (i.e. 11-12 month old).

Arvindakshan et al. (1988) concluded that, germination of coconut seed nuts depended to a great extent on the quantity and quality of the kernel (Meat) in the nut, which depended on maturity. The maximum development of kernel takes place when the nut attained full maturity. In West Coast Tall variety 12 month old seed nut were found relatively more superior, to the other age group (i.e. 11 and 13 month old), but the differences were not significant. Therefore, the seed nuts of both age groups (11 and 12 month old), were considered suitable for nursery purposes. Similar trends were also reported by Thampan (1981 b).

Kumar and Pillai (1990) revealed that, the husked and de-husked treatments of seed nut, had no deleterious effect on seedling vigor and production of quality seedling.