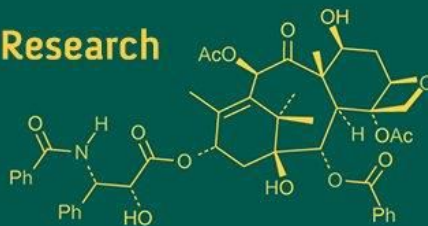
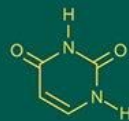
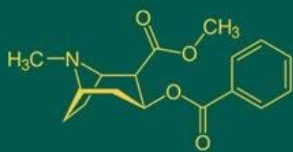


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Effect of different growing media and plant growth regulator on seed germination and seedlings growth at Bael in Prayagraj Agro-climatic condition

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Abstract

The present study entitled “Effect of different growing media and plant growth regulator on seed germination and seedling growth at Bael (*Aegle marmelos*) in Prayagraj agro-climatic condition”. was conducted at shade net, horticulture farm, Department of horticulture, Naini agriculture college SHAUTS, Prayagraj, U.P during the academic year 2022-2024. The different media and growth hormones includes T₀ (CONTROL), T₁ (soil + FYM 3:1), T₂ (Soil + vermicompost + cocopeat 2:1:1), T₃ (Soil + vermicompost + rice husk + cocopeat 1:1:1:1), T₄ (Soil + FYM 3:1 + GA3 200 ppm), T₅ (Soil + FYM 3:1 + GA3 400 ppm), T₆ (soil + vermicompost + cocopeat 2:1:1 + NAA 200 ppm), T₇ (soil + vermicompost + rice husk + cocopeat 1:1:1:1 + NAA 400 ppm), T₈ (soil + vermicompost + cocopeat 2:1:1 + GA3 200 ppm), T₉ (Soil + vermicompost + cocopeat 2:1:1 + GA3 400 ppm), T₁₀ (soil + vermicompost + cocopeat 2:1:1 + NAA 200 ppm), T₁₁ (Soil + vermicompost + cocopeat 2:1:1 + NAA 400 ppm), T₁₂ (Soil + vermicompost + rice husk + cocopeat 1:1:1:1 + GA3 200 ppm), T₁₃ (Soil + vermicompost + rice husk + cocopeat 1:1:1:1 + GA3 400 ppm), T₁₄ (Soil + vermicompost + rice husk + cocopeat 1:1:1:1 + NAA 200 ppm), T₁₅ (Soil + vermicompost + rice husk + cocopeat 1:1:1:1 + NAA 400 ppm). Observation to be recorded for 6 months Days to germination, Germination index, Days to first shoot initiation, Days to first leaf initiation, Shoot length (1MAS, 2MAS, 3MAS) No. of leaves (1MAS, 2MAS, 3MAS), No. of new shoots (1MAS, 2MAS, 3MAS), Root length Fresh weight of roots, Dry weight of roots, Plant height, Stem girth, Seed vigour, Seed vigour index, SPAD (soil plant analysis development) value of chlorophyll content, Leaf area measuring by graph paper method, Survival percentage. On this trial T₁₁ (Soil + vermicompost + cocopeat 2:1:1 + NAA 400 ppm) was found to be best in terms of germination percentage, growth parameters with (85.98) survival percentage of Bael (*Aegle marmelos*) and minimum was found in T₀ (control).

Keywords: Bael, GA3 (Gibberellic acid), NAA (Naphthalene acetic acid), Cocopeat, Vermicompost, Rice husk, FYM

Introduction

Bael (*Aegle marmelos*) is a tropical fruit trees and highly heterozygous. Due to its hardness, the Bael tree is very adapTable to wide range of soil and climatic conditions. Bael is a native species to India. It is a member of Rutaceae family and in India it is popularly referred as Bengal quince, Bilva, Indian quince, Golden apple, Holy fruits, Bel, Belwa, Sripthal, Stone apple and Maredo.

In India, it is grown in Uttar Pradesh, Orissa, Bihar, West Bengal and Madhya Pradesh. It needs a subtropical environment with hot and dry summer and mild winter. Fruits is well known for its therapeutic qualities due to presence of marmelosin. Mature fruit is astringent, digestive and stomachic in nature and is often used to treat diarrhoea and dysentery. Ripe fruit is tonic, restorative and laxative, as well as beneficial for the heart and brain. Bael fruit is very popular due to its constipation - fighting properties. Anti-inflammatory and wound - healing properties are found in Bael root extract.

The Bael fruit is rich in nutrients and has a high concentration of vitamins and minerals. It contains 1.8 g protein, 0.39 g fat, 1.7g minerals, 31.80 gm carbohydrates, 55 mg carotene, 0.13 mg thiamine, 1.19 mg riboflavin, 1.1 mg niacin and 8mg vitamin C per 100g of edible portion. The fruit can be eaten either fresh from trees or after being dried and produced into candy, toffee, pulp powder or nectar. When fresh, the juice is strained and sweetened to make a drink

similar to lemonade. It can be made into sharbat or Bael Pana, a beverage. Bael Pana in Odisha has fresh cheese, milk, water, fruit pulp, sugar and citron juice, is mixed, left to stand a few hours, strained, and serve with ice. One large Bael fruit may yield two to three liters of sharbat if the fruit is to be dried, it is usually sliced and sun dried. The hard leathery slices are then immersed in water. Owing to hardy nature, Bael tree has a wide adaptability to adverse soil and climatic conditions. It requires sub-tropical climate where summer is hot and dry, and winter is mild. Plant can be grown even up to an elevation of 1,200 m. they are not damaged by temperature as low as -7 °C.

Typically Bael is propagated through seed. Being a cross pollinated crop the seedlings are not true to type and having great degree of variation. Asexual propagation have shown to be very effective in recent years and their usage to be encouraged. However seedling must be grown for vegetative propagation (grafting and budding). Seedling trees produce fruit of varying size and quality, but they usually required more time to start bearing. Seeds are utilized to produce seedlings onto which the desired variety (scion) may be grafted. The majority of fruit seeds germinate poorly and unevenly, causes wastage of money, time and energy.

Bael seed germinate between 13 and 27 days after planting. Additionally, Bael seeds lose viability during storage stored for a long period of time. Owing to the seedlings sluggish growth rate, it take a long time to raise the Bael seedling and takes around one year for the seedlings to be ready for budding and grafting. The rooting system in terms of development and maintenance mainly depend on the growing media.

The dormancy in seed might be due to hard seed coat impermeability to water and gaseous, physiologically immaturity of embryo deficiency of some indigenous growth promoters of excess of indigenous inhibitors. Different method like water soaking scarification and chemical treatment are used for breaking dormancy in such seed to improve dees germination.

The farmyard manure (FYM) seems to be directly responsible for increasing crop yield either by accelerating the respiratory process, by increasing cell permeability, and hormone growth action, or by combination of all these processes. It supplies nitrogen, phosphorus, potassium and sulphur in available forms to the plants through biological decomposition. Indirectly, it improves physical properties of soil such as aggregation of soil, permeability and water holding capacity. It is prepared from the dung of farm animals and contains all the essential elements like nitrogen (0.5-1.5%), phosphorus (0.4-0.8%) and potassium (0.5-0.9%). Vermicompost, an eco-friendly natural fertilizer prepared from biodegradable organic wastes and rich in macro and micronutrients.

Cocopeat is obtained after the extraction of fiber from the coconut husk and it is an agricultural by-product. It can be used to produce a number of crop species with acceptable quality in the tropics. It is conserved as a good growing media component with acceptable pH, electrical conductivity and other chemical attributes. It exhibited good physical properties high total pore space, high water content, low shrinkage, low bulk density and slow bio-degradation. The initial level of potassium and sodium is usually high in cocopeat, so, the fertilization program should be adjusted carefully according to plant requirements.

Plant hormone play a key role in fruit crop production by influencing directly or indirectly various plant process like germination rooting, growth and productivity.

Some plant growth regulator have been found to be helpful in germination of Bael seeds by increasing water uptake and exerting an effect on membrane permeability this result indicates that use of plant growth regulator might have had to break the embryo dormancy and induction of synthesis of alpha amylase and other hydrolytic enzymes.

Plant growth regulator like GA3 and NAA enhanced the germination growth and survival of seedling. GA3 is used for weakening of the seed coat so that the radical of the seedling can break through the seed coat. GA3 induces the synthesis of amylase and other hydrolytic enzymes during the early stages of seed germination. GA3 controls mobilization of starch which acts as a respiratory substrate to leading to immediate enhancement in cell elongation. Gibberellins also helps in enhancing the availability of reserved mineral elements which promotes the germination processes.

Naphthalene acetic acid (NAA)

Naphthalene acetic acid (NAA) is an aromatic acid and a synthetic plant hormone in the auxin group, similar to naturally occurring indoleacetic acid in its action on plants. NAA is responsible for stimulation of cell division, cell elongation, elongation of shoot, photosynthesis, RNA synthesis, membrane permeability, water uptake and involved in many physiological processes like plant growth, prevention of preharvest fruit drop, flower induction, fruit set, delayed senescence and prevention of bud sprouting, leaf chlorophyll content and increased yield in fruit crops. An exogenous application of naturally occurring or synthetic plant growth regulators affects the endogenous hormonal pattern of the plant either by supplementation of sub-optimal levels or by inter-action with their synthesis, translocation or inactivation of existing hormone levels.

Gibberellic acid (GA3)

Gibberellins are one of the important plant growth regulator involved in the natural process of breaking dormancy and other aspects of seed germination before the photosynthetic apparatus develops sufficiently in the early stages of germination, the stored energy reserves of starch nourish the seedling. Usually in germination, the breakdown of starch to glucose in the endosperm begins shortly after the seed is exposed to water. Gibberellins in the seed embryo are believed to signal starch hydrolysis through inducing the synthesis of the enzyme α -amylase in the aleurone cells.

Materials and Methods

The present investigation entitled "Effect of different growing media and plant growth regulator on seed germination and seedlings growth at Bael in Prayagraj agro-climatic condition. will be carried out at Department of Horticulture, Naini Agriculture Institute, Sam Higginbottom University of Agriculture Technology of Science (SHAUTS), Prayagraj (U.P), Latitude 25. 4137N and Longitude 81.8491E during the summer season of the year 2023-24. The required number of healthy and disease free seeds were selected to sow and were grown under the required cultural package and practices.

The treatment combinations are as follow

T₀ (CONTROL), T₁ (soil + FYM 3:1), T₂ (Soil + vermicompost + cocopeat 2:1:1), T₃ (Soil + vermicompost +

rice husk + cocopeat 1:1:1:1), T₄ (Soil + FYM 3:1 + GA3 200 ppm), T₅ (Soil + FYM 3:1 + GA3 400 ppm), T₆ (soil + vermicompost + cocopeat 2:1:1 + NAA 200 ppm), T₇ (soil + vermicompost + rice husk + cocopeat 1:1:1:1 + NAA 400 ppm), T₈ (soil + vermicompost + cocopeat 2:1:1 + GA3 200 ppm), T₉ (Soil + vermicompost + cocopeat 2:1:1 + GA3 400 ppm), T₁₀ (soil + vermicompost + cocopeat 2:1:1 + NAA 200 ppm), T₁₁ (Soil + vermicompost + cocopeat 2:1:1 + NAA 400 ppm), T₁₂ (Soil + vermicompost + rice husk + cocopeat 1:1:1:1 + GA3 200 ppm), T₁₃ (Soil + vermicompost + rice husk + cocopeat 1:1:1:1 + GA3 400 ppm), T₁₄ (Soil + vermicompost + rice husk + cocopeat 1:1:1:1 + NAA 200 ppm), T₁₅ (Soil + vermicompost + rice husk + cocopeat 1:1:1:1 + NAA 400 ppm). The data were recorded every 1 months after sowing and the trial is completed in 6 months. With 3 replication in Randomized Block Design (RBD).

Result and Discussion

Days to germination: The observation on days to germination in Bael seeds which was recorded during the experiment period on the evaluation of different media and growth hormone on Bael seed is depicted in the Table 1.

The effect of different growing media and growth hormones on Bael seeds is very obvious and consistent. Results revealed that the days to germination in Bael seeds was recorded in T₁₁ (6.3) (Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm) followed by T₁₅ (6.63) (Soil + vermicompost + rice husk + cocopeat (1:1:1:1) + NAA400 ppm) and minimum was recorded by T₀ (12.3) (CONTROL).

The significant and positive increase on days to germination in Bael seeds might be due to application of different media and growth hormones which resulted helpful improving in germination. The result are in conformity with the Amarnath *et al.* (2015).

Days to leaf initiation

The observation on leaf initiation which was recorded during the experiment period on the evaluation of different media and growth hormone on Bael seed is depicted in the Table 1. The effect of different growing media and plant growth regulator on leaf initiation in Bael seeds is very obvious and consistent. The maximum leaf initiation was observed in T₁₁ (9.34) (Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm) Followed by T₇ (9.39) (Soil + vermicompost + ricehusk + cocopeat (1:1:1:1) + NAA 400 ppm) and minimum was recorded in T₀ (22.7) (CONTROL).

The leaf initiation were greatly impacted by the different growing media and growth regulator, this may have been caused by the fact that days of leaf initiation increases. Barkoulas M (2008) noted the same outcome while examining the growth and germination parameters of several genotypes of Bael. Kougiumoutzi E (2008) The leaf initiation was highest in Bael (6.3) when treated with different growing media and growth regulator; while increase in the storage period, the leaf initiation was simultaneously decreased regardless the Bael varieties.

Days to first shoot initiation

The observation on first shoot initiation in Bael seeds was recorded during the experimental period on the evaluation of different growing media and plant growth regulators on Bael seeds is depicted in Table 1.

The effect of different growing media and plant growth regulators on Bael seeds is very obvious and consistent. The maximum shoot initiation was recorded by T₁₁ (7.8) (Soil +

vermicompost + cocopeat (2:1:1) + NAA 400 ppm) followed by T₆ (7.4) (Soil + vermicompost + cocopeat (2:1:1) + NAA 200 ppm) and minimum recorded by T₀ (19.7) (CONTROL). The shoot initiation were greatly impacted by the different growing media and growth regulator, this may have been caused by the fact that days of leaf initiation increases. Chaudhari BK (1982) noted the same outcome while examining the growth and germination parameters of several genotypes of Bael Gawankar *et al.* (2020). The leaf initiation was highest in Bael (9.34) when treated with different growing media and growth regulator; while increase in the storage period, the shoot initiation was simultaneously decreased regardless the Bael varieties.

SPAD (Soil Plant Analysis Development Value for Chlorophyll Content) on Bael leaf

The observation of different media and growth regulators on SPAD (Soil Plant Analysis Development Value for Chlorophyll Content) on Bael Leaf was recorded during the experimental period on the evaluation of different growing media and growth regulators on Bael seeds is depicted on Table 1.

The effect of different growing media and growth regulators on Bael seed is very obvious and consistent. The maximum content of chlorophyll was recorded in T₁₁ (63.0) (Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm) followed by T₁ (60.3) and minimum recorded was observed by T₀ (15.8) CONTROL. The maximum content of chlorophyll was recorded in T₁₁.

The use of growth hormone and different growing media, enhanced the process of photosynthesis, which required more light absorption and water, resulting in higher chlorophyll concentration. The different growing media considerably boosted the photosynthetic pigments of Bael. Different media acted by accumulating nutrition elements front plant parts to sites where GA₃ accumulated, and some of these nutrition elements became components of new chlorophyll molecules). According to Dayeswari *et al.* 351, vermicompost enhanced nitrogen availability, which might have assisted in the production of chlorophyll and amino acids.

Root length

The observation on different growing media and growth regulator on root length of Bael seeds was recorded during the experimental period on the evaluation of different growing media and growth regulators on Bael seeds is depicted on Table 1.

The effect of different growing media and growth regulators on Bael seed is very obvious and consistent. The maximum of roots length was recorded in T₁₁ (25 cm) (Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm) followed by T₆ (10 cm) and minimum recorded was observed by T₁ (7 cm) CONTROL.

In Bael when we used growth hormones and different growing media as ingredients of Bael seed sowing. Endogenous levels of GA₃ generated by the Bael seedling may not be sufficient, and external application of GA₃ may have increased growth by enhancing cell multiplication and cell elongation, resulting in improved Bael plant development. According to Khan *et al.* [19], cocopeat is an organic manure that is directly beneficial to plant growth of Bael by providing all necessary macro- and micronutrients in their easily accessible forms during mineralization and enhancing the physical and chemical properties of soils.

Fresh weight of Bael roots after 6 months of sowing

The observation on different growing media and growth regulator on fresh weight of Bael roots after 6 months was recorded during the experimental period on the evaluation of different growing media and growth regulators on Bael seeds is depicted on Table 1.

The effect of different growing media and growth regulators on Bael seed is very obvious and consistent. The maximum fresh weight of Bael roots after 6 months of sowing was recorded in T₁₁ (4.45 g) (Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm) followed by T₁₅ (3.45 g) and minimum recorded was observed by T₀ (2.06 g) CONTROL. NAA increase the fresh weight of roots in Bael seedlings, possibly due to its effect on increasing cell division, cellular and auxin metabolism, cell wall flexibility and cell membrane permeability. Nazari *et al.* (25) observed that the highest fresh weight of roots was observed in Bael roots grown with cocopeat as media.

Dry weight of Bael roots after 6 months of sowing

The observation on different growing media and growth regulator on dry weight of Bael roots after 6 months was recorded during the experimental period on the evaluation of different growing media and growth regulators on Bael seeds is depicted on Table 2.

The effect of different growing media and growth regulators on Bael seed is very obvious and consistent. The maximum dry weight of Bael roots after 6 months of sowing was recorded in T₁₁ (3.20 g) (Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm) followed by T₈ (2.57 g) and minimum recorded was observed by T₀ (1.4g) CONTROL.

The growth hormones may be involved in the metabolism, translocation, and accumulation of water and nutrients delivered at a faster rate, which may have stimulated more photosynthesis, resulting in a rise in the total dry weight of Bael root. Manilkara Hexandra *et al.* (2016). The highest dry weight of root of Bael was recorded in medium containing cocopeat. This might be due to increase water use efficiency in plants, thus increasing photosynthesis and plant biomass.

Plant height of Bael after 6 months of sowing

The observation which was recorded during the experiment period on the evaluation of different media and plant growth regulator on plant height of Bael is depicted in Table 2.

The effect of different media and growth hormone on plant height of Bael is very obvious and consistent. There was significant difference among the impact of the different media and growth hormone on plant height after 6 months of sowing with maximum plant height in T₁₁ 38.91 cm respectively, followed by T₁₄ cm 37.43 cm and minimum was recorded by T₀ CONTROL 25.03cm. The evaluation of different media and growth hormone for plant height reveals significant diversity.

The use of growing media and plant growth hormones gives us plants perfectly grown. Especially using of GA3 gives us better result as compared to other hormones which stimulates cell elongation and cause plants to grow taller. On the other hand giving efficiency use of water to plants also promotes plants growth. Nazari *et al.* (25) observed that the highest plant was observed in Bael grown with cocopeat as media.

Germination % of Bael seeds

The observation which was recorded during the experiment period on the evaluation of different media and hormones on germination % of Bael observation is depicted in Table 2.

The effect of different hormones on germination % of Bael is very obvious and consistent. There was significant difference among the impact of the different treatment combinations on germination % during the course of the experiment with maximum T₁₁ (Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm) with (30.33) respectively, followed by T₁₄ (Soil + vermicompost + rice husk + cocopeat (1:1:1:1) + NAA200 ppm) 26.64. Which were significantly superior over T₀ CONTROL 16.62.

The evaluation of different growing media and plant growth hormones on germination % of Bael treated with different treatment combinations for germination percentage is critical to ascertain their adaptability and resilience to various environmental conditions. GA3 participates in two stages of germination: initial enzyme induction and activation of the reserve food mobilization mechanism, both of which improve Bael seedling germination. Shahu *et al.* 16) found that cocopeat based growing media was the most beneficial for improving germination percentage of Bael.

Leaf area (cm²)

The observation which was recorded during the experiment period on the evaluation of different media and hormones on leaf area of Bael observation is depicted in Table 2.

The effect of different hormones on leaf area of Bael is very obvious and consistent. There was significant difference among the impact of the different treatment combinations on leaf area during the course of the experiment with maximum T₁₁ (Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm) with (40.94) respectively, followed by T₅ (Soil + FYM 3:1) + GA3 400 ppm) 38.5. Which were significantly superior over T₀ CONTROL 30.55.

Bishi *et al.* (301) reported that the application of GA3 significantly increases leaf area of fruit crops. This could be because gibberellins boosted cell division, elongation, and length as epidermal and parenchymal cell numbers grew. Vermicompost also contains phosphate-solubilizing bacteria, azotobacter, and azospirillum, which were all included in the microbial community. According to Hazarika *et al.* (31), beneficial microorganisms with the ability to provide controlled growth material, resulting in increased leaf area in Bael.

Seed vigour

The observation which was recorded during the experiment period on the evaluation of different media and hormones on seed vigour of Bael observation is depicted in Table 2. The effect of different hormones on seed vigour of Bael is very obvious and consistent. There was significant difference among the impact of the different treatment combinations on seed vigour during the course of the experiment with maximum T₁₁ (Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm) with (1537) respectively, followed by T₂ (Soil + FYM 3:1) 1008. Which were significantly superior over T₀ CONTROL 687. Vithirak and Iwail (22) observed that vermicompost significantly increased the seed high vigor in Bael. GA3 may aid in seed vigor via seed sowing because this treatment is ideal for the metabolic response, enhancing seed germination efficiency, and promoting seedling growth of Bael.

Seed vigour index

The observation which was recorded during the experiment period on the evaluation of different media and hormones on

seed vigour index of Bael observation is depicted in Table 3. The effect of different hormones on seed vigour index of Bael is very obvious and consistent.

There was significant difference among the impact of the different treatment combinations on seed vigour index during the course of the experiment with maximum T₁₁ (Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm) with (1180.14) respectively, followed by T₂ (Soil + vermicompost + cocopeat 2:1:1) 506.62. Which were significantly superior over T₀ Control 415.9.

Vithirak and Iwail (22) observed that vermicompost significantly increased the seed high vigor index in Bael. GA₃ may aid in seed vigor index via seed sowing because this treatment is ideal for the metabolic response, enhancing seed germination efficiency, and promoting seedling growth of Bael.

Stem girth after 6 months of sowing

The observation which was recorded during the experiment period on the evaluation of different media and hormones on stem girth after 6 months of sowing of Bael observation is depicted in Table. The effect of different hormones on stem girth after 6 months of Bael is very obvious and consistent.

There was significant difference among the impact of the different treatment combinations on seed vigour index during the course of the experiment with maximum T₁₁ (Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm) with (6.10) respectively, followed by T₄ (Soil + FYM 3:1 + GA₃ 200 ppm) 3.50. Which were significantly superior over T₀ CONTROL 3.40.

Vieira *et al.* 20 also reported that Gibberellins promote stem cell proliferation, a transverse arrangement of microtubules that governs the direction of cellulose microfibril deposition, and increased stem girth in Bael plants. Vermicomposting with cocopeat may improve soil porosity, water content, drainage pore, soil permeability, water availability, air flow in the soil, and the availability of improved nutrition with water and air in the root zone of the Bael seedlings, indicating an increased stem girth of the Bael seedling.

Survival % of Bael after 6 months of sowing

The observation which was recorded during the experiment period on the evaluation of different media and hormones on survival percentage after 6 months of sowing of Bael observation is depicted in Table 3. The effect of different hormones on survival percentage after 6 months of Bael is very obvious and consistent.

There was significant difference among the impact of the different treatment combinations on survival percentage during the course of the experiment with maximum T₁₁ (Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm) with (85.98) respectively, followed by T₁ (Soil + FYM 3:1) 70.00. Which were significantly superior over T₀ CONTROL 69.00.

Growth hormones maintained a high water content in the cell, accelerated cell division and cell elongation, which increased seedling germination and overall growth, which may have contributed to higher seed vigour. The retention of more water and air by vermicompost aided in speedy and early enzymatic action for the synthesis of metabolites for cell multiplication, as well as the breakdown of the seed coat, culminating in the embryo's metamorphosis into a seedling at an early enough stage.

No. of leaves of Bael seeds

The observation which was recorded during the experiment period on the evaluation of different media on number of leaves of Bael is depicted in Table 3.

The effect of different media on number of leaves of Bael is very obvious and consistent. There was significant difference among the impact of the different media on number of leaves. The maximum Number of leaves was observed in T₁₁ (Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm).

The impact of different Media and growth regulator of Bael on leaf numbers varies considerably. Genetic factors, environmental conditions, and cultural practices collectively influence leaf production. Evaluating leaf numbers across various media and plant growth regulator enables growers to identify cultivars with desirable leaf characteristics, potentially indicating vigorous growth and photosynthetic capacity. Understanding these effects assists in selecting different media that optimize foliage development, contributing to overall plant health and productivity in Bael cultivation.

Shoot length of Bael seeds for 6 months after sowing

The observation which was recorded during the experiment period on the evaluation of different media on shoot length of Bae seed after 6 months of sowing is depicted in Table 3.

The effect of different media on number of leaves of Bael is very obvious and consistent. There was significant difference among the impact of the different media on number of leaves. The maximum Number of leaves was observed in T₁₁ Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm.

The impact of different Media and growth regulator of Bael on shoot length varies considerably. Genetic factors, environmental conditions, and cultural practices collectively influence shoot length. Evaluation across various media and plant growth regulator enables growers to identify cultivars with desirable shoots length, potentially indicating vigorous growth and photosynthetic capacity. Understanding these effects assists in selecting different media that optimize foliage development, contributing to overall plant health and productivity in Bael cultivation.

No. of new shoot for 6 months after sowing

The observation which was recorded during the experiment period on the evaluation of different media on no. of new shoots of Bae seed after 6 months of sowing is depicted in Table 3.

The effect of different media on number of new shoots of Bael is very obvious and consistent. There was significant difference among the impact of the different media on number of leaves. The maximum Number of leaves was observed in T₁₁ (Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm).

The impact of different Media and growth regulator of Bael on no. of new shoots varies considerably. Genetic factors, environmental conditions, and cultural practices collectively influence leaf production. Evaluating leaf numbers across various media and plant growth regulator enables growers to identify cultivars with desirable leaf characteristics, potentially indicating vigorous growth and photosynthetic capacity. Understanding these effects assists in selecting different media that optimize foliage development, contributing to overall plant health and productivity in Bael cultivation.

Table 1: Effect of different growing media and growth hormones on different observation

Notation	Treatment combination	Days to germination	Days to Leaf Initiation	Days to first shoot Initiation	SPAD value for chlorophyll content in Bael leaf	Root length (cm)	Fresh weight of roots (g)
T ₀	Control	12.3	22.7	19.7	15.8	7 cm	2.06
T ₁	Soil + FYM (3:1)	11.6	10.2	9.2	60.3	13 cm	1.97
T ₂	Soil + Vermicompost + cocopeat (2:1:1)	10.0	11.4	9.4	60.1	15.5 cm	1.27
T ₃	Soil + vermicompost + rice husk + cocopeat (1:1:1:1)	9.5	10.5	8.5	50.9	14 cm	1.26
T ₄	Soil + FYM (3:1) + GA3 200 ppm	13.8	9.53	7.9	54.7	15 cm	1.63
T ₅	Soil + FYM (3:1) + GA3 400 ppm	12.4	10.4	7.13	57.5	10.5 cm	2.10
T ₆	Soil + vermicompost + cocopeat (2:1:1) + NAA 200 ppm	15	9.45	7.4	52.4	10 cm	3.09
T ₇	Soil + vermicompost + rice husk + cocopeat (1:1:1:1) + NAA 400 ppm	12.3	9.39	7.22	59.9	13 cm	1.58
T ₈	Soil + vermicompost + cocopeat (2:1:1) + GA3 200 ppm	11.3	9.63	8.4	24.7	25 cm	2.40
T ₉	Soil + vermicompost + cocopeat (2:1:1) + GA3 400 ppm	8.3	10	8	48.0	11 cm	2.58
T ₁₀	Soil + vermicompost + cocopeat (2:1:1) + NAA 200 ppm	9.3	10.3	8.9	45.1	11.5 cm	2.23
T ₁₁	Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm	6.3	9.34	7.8	63.0	25 cm	4.45
T ₁₂	Soil + vermicompost + rice husk + cocopeat (1:1:1:1) + GA3 200 ppm	8.9	10.5	9.5	48.0	13 cm	2.03
T ₁₃	Soil + vermicompost + rice husk + cocopeat (1:1:1:1) + GA3 400 ppm	9.5	9.64	8.6	51.1	15.7 cm	2.23
T ₁₄	Soil + vermicompost + rice husk + cocopeat (1:1:1:1) + NAA200 ppm	9.0	10.9	9.9	51.1	15.3 cm	2.45
T ₁₅	Soil + vermicompost + rice husk + cocopeat (1:1:1:1) + NAA400 ppm	6.63	10.7	8.4	42.3	14.5 cm	3.45
	F-test	S	S	S	S	S	S
	SEd	0.748	0.681	0.870	0.113	0.734	1.175
	CD (5%)	1.532	1.425	1.856	0.226	1.568	2.350
	CV	2.224	2.432	3.712	0.349	3.136	4.700

Table 2: Effect of different growing media and growth hormones on different observation

Notation	Treatment Combination	Dry weight of roots (g)	Plant height (cm)	Germination %	Leaf area (cm ²)	Seed vigour
T ₀	CONTROL	1.4	25.03	16.62	30.55	687
T ₁	Soil + FYM (3:1)	1.67	28.90	19.33	35.55	1008
T ₂	Soil + Vermicompost + cocopeat (2:1:1)	1.40	27.73	18.27	37.55	1018
T ₃	Soil + vermicompost + rice husk + cocopeat (1:1:1:1)	1.00	30.63	17.81	4.55	1108
T ₄	Soil + FYM (3:1) + GA3 200 ppm	1.97	34.10	20.13	37.55	1107
T ₅	Soil + FYM (3:1) + GA3 400 ppm	1.10	35.07	23.64	38.5	1098
T ₆	Soil + vermicompost + cocopeat (2:1:1) + NAA 200 ppm	1.07	35.71	24.87	36	1190
T ₇	Soil + vermicompost + rice husk + cocopeat (1:1:1:1) + NAA 400 ppm	1.30	31.20	20.46	34.94	1276
T ₈	Soil + vermicompost + cocopeat (2:1:1) + GA3 200 ppm	2.57	33.50	25.36	31.55	1108
T ₉	Soil + vermicompost + cocopeat (2:1:1) + GA3 400 ppm	2.13	34.30	21.13	34.38	1187
T ₁₀	Soil + vermicompost + cocopeat (2:1:1) + NAA 200 ppm	1.57	36.57	24.62	36.44	1489
T ₁₁	Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm	3.20	38.91	30.33	40.94	1537
T ₁₂	Soil + vermicompost + rice husk + cocopeat (1:1:1:1) + GA3 200 ppm	1.40	33.87	21.27	36.17	1309
T ₁₃	Soil + vermicompost + rice husk + cocopeat (1:1:1:1) + GA3 400 ppm	2.17	36.97	19.13	34.61	1267
T ₁₄	Soil + vermicompost + rice husk + cocopeat (1:1:1:1) + NAA200 ppm	1.47	37.43	26.64	36.17	1156
T ₁₅	Soil + vermicompost + rice husk + cocopeat (1:1:1:1) + NAA400 ppm	1.30	36.57	20.81	32.66	1234
	F-test	S	S	S	S	S
	SEd	1.223	0.149	1.875	1.144	8.607
	CD (5%)	3.129	0.278	3.750	2.361	18.347
	CV	6.669	0.394	7.500	4.722	36.694

Table 3: Effect of different growing media and growth hormones on different observation.

Notation	Treatment Combination	Seed vigour index	Stem girth (cm)	Survival %	No. of leaves	Shoots length	No. of new shoots
T ₀	CONTROL	415.9	3.40	69.00	33.00	21.00	1.25
T ₁	Soil + FYM (3:1)	558.63	3.73	70.00	35.00	24.00	2.35

T ₂	Soil + Vermicompost + cocopeat (2:1:1)	506.62	3.93	72.00	37.00	25.65	1.58
T ₃	Soil + vermicompost + rice husk + cocopeat (1:1:1:1)	545.52	4.00	74.00	38.00	27.00	1.75
T ₄	Soil + FYM (3:1) + GA3 200 ppm	686.43	3.50	75.44	39.00	30.45	1.75
T ₅	Soil + FYM (3:1) + GA3 400 ppm	829.25	4.67	76.25	42.00	32.66	2.25
T ₆	Soil + vermicompost + cocopeat (2:1:1) + NAA 200 ppm	887.85	4.87	78.00	43.00	35.00	1.91
T ₇	Soil + vermicompost + rice husk + cocopeat (1:1:1:1) + NAA 400 ppm	638.35	5.17	80.87	45.00	33.00	1.58
T ₈	Soil + vermicompost + cocopeat (2:1:1) + GA3 200 ppm	849.56	5.40	80.14	47.00	32.74	2
T ₉	Soil + vermicompost + cocopeat (2:1:1) + GA3 400 ppm	724.75	4.07	81.00	48.00	34.00	2
T ₁₀	Soil + vermicompost + cocopeat (2:1:1) + NAA 200 ppm	900.35	4.73	80.25	45.00	35.87	1.91
T ₁₁	Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm	1180.14	6.10	85.98	54.00	50.89	2.5
T ₁₂	Soil + vermicompost + rice husk + cocopeat (1:1:1:1) + GA3 200 ppm	720.41	5.00	70.04	49.00	39.00	1.91
T ₁₃	Soil + vermicompost + rice husk + cocopeat (1:1:1:1) + GA3 400 ppm	707.23	4.98	75.15	50.00	35.23	1.75
T ₁₄	Soil + vermicompost + rice husk + cocopeat (1:1:1:1) + NAA200 ppm	997.13	5.40	80.00	51.00	35.77	1.5
T ₁₅	Soil + vermicompost + rice husk + cocopeat (1:1:1:1) + NAA400 ppm	761.02	5.00	82.00	49.00	37.00	1.33
	F-test	S	S	S	S	S	S
	SEd	55.18	0.281	2.745	0.151	1.172	0.180
	CD (5%)	167.21	0.583	5.376	0.302	2.344	0.37
	CV	223.67	1.126	10.875	0.453	3.516	0.54

Conclusion

On the basis of our experimental findings it can be concluded that the treatment T₁₁ (Soil + vermicompost + cocopeat (2:1:1) + NAA 400 ppm) was found to be best in terms of germination percentage growth parameters with (85.98) survival percentage of Bael (*Aegle marmelos*)

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