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Research Article

Influence of Various Nutrient Media on the Seed Germination, Growth and Development of Acacia (*Acacia Auriculiformis* L.)

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ABSTRACT

The present research was carried out in 2022-23 at the SAU Nursery, Sindh Agriculture University, Tandojam, Pakistan. To assess the influence of various Nutrient Media on seed germination growth and development of Acacia (*Acacia auriculiformis* L.) The experimental trial was carried out in Completely Randomized Design (CRD) with three replications. Acacia seeds were grown in Nutrient Media comprising canal silt, farmyard manure, rice husk and dry leaves in (1:1) among the nutrient media comprising canal silt + Rice husk (1:1) has shown the best result in germination and growth parameters. *Viz* germination (83.33%), plant height (17.70cm), number of branches plant^{-1} (27.66), fresh biomass of shoot (30.27g), dry biomass of shoot (14.15g), and quality index (0.78) while the poor results was recorded in canal silt germination (23.33%), Based on Nutrient Media, NM_3 canal silt + Rice husk (1:1) performed better germination growth and development of Acacia, the present study that the Nutrient MediaNM_3 =canal silt + rice husk (1:1) had better result for all parameters. It has been suggested that Acacia may be nourished with Nutrient Media Canal Silt + Rice husk (1:1) and also good in Canal silt + Dry leaves (1:1).

Keywords: Rice husk, Dry leaves, Germination, Farmyard manure, Quality index

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INTRODUCTION

Acacia (*Acacia auriculiformis* L.) belongs to the family of Fabaceae, it is a multi-purpose legume of the genus mimosa, originating from South and Southeast Asia.(DK. and MK., 2001).The demand for different types of land use and the constant deforestation are the reasons for the decline of natural forests. Thus, the constant supply of wood from natural forests becomes very difficult for various purposes(Asif et al., 2017).

Plantations of fast-growing species should be established as a compensation package to reduce the supply of natural forests (Sharma et al., 2011). Acacia is an evergreen, exotic, multi-branched, multi-flowered species, grown mainly on highways, railway embankments, in parks and gardens, due to its resistance to decoration and drought (Hossain et al., 2009; Islam et al., 2013). It is considered one of the most promising plant species for cultivation due to its ability to survive in various degraded environmental conditions. (Jahan et al., 2008).

Thus, Acacia is currently one of the first choices for reforestation, reforestation, and agroforestry in many South Asian countries (Azad et al., 2011). High-quality and hard-wearing Acacia wood core is suitable for use in the furniture industry and other construction purposes (Pinyopusarerk, 1990). In addition, acacia wood is perfect for the production of fuel wood and charcoal, and it has also proven to be a good type of wood pulp to meet high demand, which is why many organizations produce acacia seedlings in nurseries (Khan et al., 2014). The productivity of the farm was found to be below the expected standards. This can be attributed to the reduced soil fertility and stunted growth resulting from seedling competition, particularly in nurseries (Hulikatti and Madiwalar, 2011). To establish a successful company, the creation of a nursery is a crucial step. Direct sowing can lead to the loss of improved seeds, including potential mortality and death of seedlings which makes planting in a nursery an essential step (Adu-Berko et al., 2011; Adu-Yeboah et al., 2015). Therefore, it is imperative to ensure the proper care and management of the nursery to optimize the yield of the farm. Moreover, in contemporary forest nursery practices, the size, shape, length, and diameter of containers, as well as various pre-sowing treatments, are essential to achieving optimal germination and the desired number of seedlings in the nursery (Annapurna et al., 2004; Farhadi et al., 2013). These dimensional characteristics play a crucial role in determining the quality of the seedlings produced. Therefore, it is imperative to carefully select the appropriate container size and pre-sowing treatments to ensure high-quality seedling production in the nursery.

Seed treatment is a basic practice aimed at improving and ensuring uniform seed germination (Azad et al., 2006). Several studies have reported the effect of pre-sowing processing on the germination of various seeds in tropical forests (Khan et al., 2001; Koirala et al., 2000). However, there is limited literature on the effect of pretreatment of acacia seeds on germination. Insufficient germination of acacia seeds and delays in setting up Acacia seedlings prevent intensive cultivation in agroforestry, community forestry and home gardening. Using appropriate processing methods before sowing can increase the germination rate of acacia seeds and solve the problem. Thus, the purpose of this research was to determine the best pre-sowing processing methods to improve germination and seedling growth of Acacia (Matin et al., 2006).

Forest resources are critical for sustainable development, yet they face numerous challenges, including nutritional deficiencies, pests, and diseases (Coetzee et al., 2011). To address these challenges, various approaches have been taken, such as selecting nurseries that produce plant materials with high pest and disease resistance, implementing effective forest management practices, and utilizing biological controls and biostimulants. For example, bio-organic fertilizers, such as rings produced by the Indonesian Institute of Sciences, have been demonstrated to improve forest health (Francis et al., 2008). These fertilizers can be used as an alternative to chemical fertilizers, as they are environmentally friendly and can enhance soil fertility, plant growth, and disease resistance. By employing such strategies, forest managers can increase the productivity and sustainability of forest resources, while also reducing negative impacts on the environment.

Organic fertilizers contain complex macronutrients, such as nitrogen (n), phosphorus (P), potassium (K), calcium (CA), magnesium (mg), oxygen (O), as well as trace elements such as iron (Fe).), phosphorus (P), manganese (Mn), copper (CU), zinc (Zn), molybdenum (MU), sodium (Na), Cobalt (Co) - all this is necessary for plant growth. This fertilizer is widely used in agriculture to improve soil structure by breaking clay mineral bonds. Soil fertilization promotes soil aeration, which allows carbon (C), hydrogen (H), and oxygen (O) to penetrate the soil. This, in turn, contributes to the normal processes of transpiration and respiration. The penetration of C (CO2), H (H2) and O (O2) into the soil allows the release of nutrients from clay minerals through the mechanism of microbial biosynthesis. This biosynthesis results in the production of new nutrient-rich biomaterials available to plants (Dickson et al., 1960). By using this fertilizer, Foresters can improve soil fertility and plant growth, thereby increasing the productivity and sustainability of forest resources.

MATERIALS AND METHODS

The present research was carried out during rabi 2022-23 at The SAU Nursery, Sindh Agriculture University, Tandojam. (25°25′40.21″N 68°31′40.40″E). The experiment was laid out in a Completely Randomize Design (CRD) with three replications. A total of four treatments were prepared by mixing various components in different ratios:NM_1 Canal Silt,NM_2 Canal Silt+FYM (1:1), NM_3 Canal Silt + Rice Husk(1:1), NM_4 Canal Silt + Dry leaves (1:1).For this study one variety of Acacia (Desi).The seeds of Acacia were collected from Sindh Agriculture University, Tandojam. TheSeed germination attributes were recorded after fifteen days andgrowth and development-related parameters were recorded after one month and methodology is given below. The collected data from various observationswere statistically analyzed using Statistics 8.1 computer software (Statistix, 2006). The LSD test was applied to compare treatment superiority, where necessary at ($P<0.05$). Different parameters of calculating the germination growth and development are mentioned below.

Coefficient velocity of germination (CVG)

(CVG) provides an indicator of the germination rate. Its value increases with an increase in the number of germinated seeds and a decrease in the time required for germination. The following formula is used to calculate the vegetation rate coefficient (Jones and Sanders, 1987).

CVG=N1+N2+…+Nx/100×N1T1+…+Nx/Tx ……………………..(1)

First day of germination (FDG)

On the first day, the seeds swell or swell. Each small brown and white seed germinates the next day. Over the next 2-3 days, it gradually lengthens and the growth of small capillaries begins along its entire circumference, slightly behind the edges. To calculate the first vegetation day, the following formula is used according to (Al-Mudaris et al., 1998b).

FDG=Day on which the first Germination event occurred ………….(2)

Germination (%)

Germination percentage is the ratio of seeds that germinate to those that are tested (Lai et al., 2019); GF is the ratio of seeds that germinate at their peak to those that are tested. The following formula was used to calculate the final germination percentage according to (Scott et al., 1984).

FGP=Final no. of seeds germination in aseed lot × 100 …………………(3)

Germination index (GI)

Germination index (GI), which is an indicator of the rate and pace of germination. To calculate the germination index, the following formula is used.

GI=(10×n1)+(9×n2)….(1×n10) …………………………(4)

The germination rate of the index (GRI)

According to Beneke Arnold et al. (1991), the germination rate index (GRI) is a weighted sum of the daily number of germinated seeds.

GRI=G1/1+G2/2+…+Gx/x …………………………….(5)

Last day of germination (LDG)

The last day of calculated germination according to Al-Mudaris et al. (1998a). The following formula was used to calculate the last day of germination.

LDG=Day on which the first Germination event occurred ………..(6)

Mean germination rate (MGR)

The mean germination rate is calculated as the reciprocal of the mean germination time. The following formula was used to calculate the mean germination rate according to the (Ellis et al., 1986).

MGR=G1/1+G2/2+…Gx/x ………………….(7)

Mean germination time (MGT)

The average germination time is an indicator of the time it takes for seeds to germinate, taking into account the day most seeds germinate. To calculate the average germination rate, the following formula is used (Orchard, 1977).

MGR=∑f.x/∑f ………….(8)

Time spread germination (TSG)

TSG is a measurement of germination timespread. The equation to calculate germination percentage by following the formula by Al-Mudaris et al. (1998b).

TSG=the time in days between the first andlast Germination events occurring in a Seed lot ………(10)

Plant height (cm)

The plants reached a certain height and then the plants stopped growing, the plantswere randomly selected to be measured. The plant height was measured from 50% of random plants of each treatment. The height was measured from the base to the tip of the plant with the help of measuring scale and average values were calculated in centimeters.

Seedling Vigour Index (SVI)

It is calculated using the following equation described by Abdul-Baki and Anderson (1973).

Seedling Vigour Index (SVI)

=Seedling length

*Germination percentage

Acacia seedling's weight has been determined after one month since the experiment setup. Also, shoot and root length have been established.

Length of Leaves (mm):

Length of leaves was recorded after one month of the plant by using measurement tap from tip to pedicle of the randomly selected plants in each replication and averaged in millimeters.

Width of Leaves (mm):

Width of leaves was recorded after one month of the plant by a using measurement tap from the width of center measured randomly selected plants in each replication and averaged in millimeters.

Root Depth (cm):

A measuring tape was used to calculate the root depthfrom the bottom to the top of the root.

Number of Branches Plant^{-1}, Number of leaves Plant^{-1} and Number of Leaves Branch^{-1}

The number of leaves and branches was counted visually at the end of experiment from randomly three plants of each replication.

Diameter of Shoot:

The Diameter of the Shoot was measured by using a vernier caliper. Three readings were noted from each replication.

Standard Quotient:

Plant Height (cm)/ Collar diameter (mm)

Quality Index:

Quality index was calculated by using the following equation, described by Dickson et al. (1960).

$$\frac{\text{Total Seedling Dry Weight (g)}}{\frac{\text{Shoot height (cm)}}{\text{Collar diameter (mm)}} + \frac{\text{Shoot dry weight (g)}}{\text{Root dry weight (g)}}}$$

The fresh Biomass of the Shoot (g) and the fresh Biomass of the Root (g): were calculated by using the following equation, described by Westlake 1965.

The fresh biomass of shoot and the fresh biomass of root were measured with the help of digital weight balance by randomly selecting three plants from each replication. The roots were washed in tap water and drain out excess water for two hours.

The Dry Biomass of shoot (g) and the Dry Biomass of root (g): were calculated by using the following equation, described by Westlake (1965).

After recording data of fresh biomass of shoot and roots were dried at room temperature for 5 to 7 days. The data of dry biomass was measured with the help of digital weight balance by randomly selecting three plants from each treatment.

RESULTS

Germination (%):

The analysis of Variances showed that Germination (%) was significant ($P<0.05$)as an effect nutrient media (Table1).The results showed that maximum germination (83.33%) was recorded in NM_3followed byNM_4 (60% and 40%) recorded in NM_2respectively. Whereas the minimum germination (23.3%) was recorded in NM_1 nutrients media.

First Day of Germination:

The analysis of Variances showed that the first day of germination was significant ($P<0.05$) as an effect of nutrient media (Table1).The results showed that the maximum first day of germination (40.00) was recorded in NM_3followed by (23.33 and 16.66) records in NM_2respectively. Whereas the minimum first day of germination (13.33) was noted in NM_1 nutrients media.

Last Day of Germination:

The analysis of Variances showed that the last day of germination was significant ($P<0.05$) as an effect of nutrient media (Table-1).The results showed that the maximum last day of germination (36.66) was recorded in NM_1followed by (20.00) recorded in NM_2 and NM_4 respectively. Whereas the minimum last day of germination (16.66) was noted in NM_3=treatment.

Mean Germination Time:

The analysis of Variances showed that Mean germination time was significant (P<0.05) as an effect nutrient media (Table-1).The results showed that the maximum mean germination time (1.97) was recorded in NM_3followed by (0.94 and 0.86) records in $NM_2$and NM_4respectively. Whereas the minimum mean germination time (0.47) was noted in NM_1treatment.

Coefficient Velocity of Germination:

The analysis of Variances showed that the coefficient velocity of germination was significant (P<0.05) as an effect of nutrient media (Table 1).The results showed that the maximum coefficient velocity of germination(0.61) was recorded in NM_3 followed by (0.51 and 0.40) recorded in NM_2 and NM_{4v}respectively. Whereas the minimum coefficient velocity of germination (0.23) was noted in NM_1 treatment.

Table1. Germination (%), First Day of Germination (FDG), Last Day of Germination (LDG), Mean Germination Time (MGT) and Coefficient Velocity of Germination (CVG) in Acacia under Various Nutrient Media.

Nutrients Media	Germination (G)	First day of Germination FDG	Last Day of Germination (LDG)	Mean Germination Time (MGT)	Coefficient Velocity of Germination (CVG)
NH_1Canal Silt	23.33 d	13.33 d	36.66 a	0.47 d	0.23 d
NH_2 Canal Silt+FYM (1:1)	40.00 c	23.33 b	20.00 b	0.94 b	0.40 c
NH_3 Canal Silt + Rice Husk(1:1)	83.33 a	40.00 a	16.66 c	1.97 a	0.61 a
NH_4Canal Silt + Dry leaves (1:1)	60.00 b	16.66 c	20.00 b	0.86 c	0.51 b
SE ±	15.373	8.165	6.6667	0.3993	0.0752
LSD 0.05	6.6667	18.828	15.373	0.9209	0.1734
P-Value	0.0001	0.0459	0.0629	0.0282	0.0053
F-Value	30.2	4.22	3.67	5.16	9.43
CV	4.71	5.77	4.71	0.28	0.05

Germination Rate of Index:

The analysis of Variances showed that the germination rate of index was significant (P<0.05) as an effect of nutrient media (Table-2).The results showed that the maximum Germination rate of index (1.13) was recorded in NM_3 followed by (0.70 and 0.39) records in NM_2 and NM_4 respectively. Whereas the minimum germination rate of the index (0.24) was noted in NM_1 nutrients media.

Germination Index:

The analysis of Variances showed that the germination index was significant (P<0.05) as an effect of nutrient media (Table-2).The results showed that the maximum germination index (21.66) was recorded in NM_3followed by (15.33 and 12.00) records in NM_4 and NM_1respectively. Whereas the minimum Germination index (7.33) was noted inNM_4nutrients media.

Seedling Vigor Index:

The analysis of Variances showed that the Seedling Vigor Index was significant (P<0.05) as an effect of nutrient media (Table 2). The results showed that the maximum Seedling Vigor Index (14.67) was recorded in NM_3 followed by (9.34 and 4.69) records in NM_4 and NM_2respectively. Whereas the minimum Seedling Vigor Index (3.02) was noted in NM_1 nutrients media.

Sturdiness Quotient:

The analysis of Variances showed that the Sturdiness Quotient were significant (P<0.05) as an effect of nutrient media (Table-2).The results showed that the maximum Sturdiness Quotient (2.03) was recorded in NM_3followed by (1.09 and 0.41) recorded in NM_4 and NM_2respectively. Whereas the minimum Sturdiness Quotient (0.41) was noted in NM_1 nutrients media.

Plant Height (cm):

The analysis of Variances showed that the plant height was significant (P<0.05) as an effect of nutrient media(Table 3).The results showed that the maximum plant height (17.70cm) was recorded in NM_3followed by (15.36cm and 11.73cm) records in NM_4 and NM_2 respectively. Whereas the minimum plant height (12.83cm) was noted in NM_1 nutrients media.

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Number of Branches Plant^{-1}

The analysis of Variances showed that the number of branches Plant^{-1}was significant ($P<0.05$) as an effect of nutrients media(Table 3).The results showed that the maximum Number of Branches in Plant^{-1}(27.66) was recorded in NM_3followed by (26.00) recorded in NM_4respectively. Whereas the minimum Number of Branches in Plant^{-1}(12.66) was noted in NM_1 nutrients media.

Diameter of Shoot (mm):

The analysis of Variances showed that the diameter of shoot (mm) was significant ($P<0.05$) as an effect of nutrient media **(**Table-3). The results showed that the maximum Diameter of Shoot (0.11mm) was recorded in NM_3 followed by (0.07mm and 0.04mm) recorded in NM_4 and NM_2 respectively. Whereas the minimum Diameter of Shoot (0.03mm) was noted in NM_1nutrients media.

Number of Leaves Branches-^{1}:

The analysis of Variances showed that the number of leaves branches^{-1}was significant ($P<0.05$) as an effect of nutrient media(Table-3).The results showed that the maximum Number of leaves in branches^{-1}(65.33) was recorded in NM_3 followed by (52.66 and 45.33) recorded in NM_2 and NM_4 respectively. Whereas the minimum Number of leaves in branches^{-1}(35.33) was noted in NM_1 nutrients media.

Table 2. Germination Rate of Index (GRI), Germination Index (GI), Seedling Vigor Index (SVI) and Sturdiness Quotient (SQ) in Acacia under Various Nutrient Media.

Nutrients Media	Germination Rate of Index (GRI)	Germination Index (GI)	Seedling Vigor Index (SVI)	Sturdiness Quotient (SQ)
NH_1Canal Silt	0.24 d	12.00 c	3.02 d	0.41 d
NH_2 Canal Silt+FYM (1:1)	0.39 c	7.33 d	4.69 c	0.47 c
NH_3 Canal Silt + Rice Husk(1:1)	1.13 a	21.66 a	14.67 a	2.03 a
NH_4Canal Silt + Dry leaves (1:1)	0.70 b	15.33 b	9.34 b	1.09 b
SE ±	0.0794	2.582	1.32	0.78
LSD 0.05	0.183	5.9541	3.05	0.33
P-Value	0.0000	0.0034	0.0001	0.0047
F-Value	49.5	10.9	31.1	9.8
CV	0.05	1.82	0.93	0.24

Table 3. Plant height (cm), Number of Branches Plant^{-1} and Diameter of Shoot (mm) in Acacia under Various Nutrient Media

Nutrient Media	Plant Height (cm)	Number of Branches Plant^{-1}	Diameter of Shoot (mm)	Number of Leaves Branches^{-1}
NH_1Canal Silt	12.83 c	12.66 c	0.03 d	35.33 d
NH_2 Canal Silt+FYM (1:1)	11.73 d	12.66 c	0.04 c	52.66 b
NH_3 Canal Silt + Rice Husk(1:1)	17.70 a	27.66 a	0.11 a	65.33 a
NH_4Canal Silt + Dry leaves (1:1)	15.36 b	26.00 b	0.07 b	45.33 c
SE ±	1.5324	1.8257	0.0365	6.7987
LSD 0.05	3.5338	4.2102	0.0158	15.678
P-Value	0.0185	0.0000	0.0035	0.0131
F-Value	6.07	40.4	10.8	6.90
CV	1.08	1.29	0.01	16.77

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Number of Leaves Plant^{-1}:

The analysis of Variances showed that the Number of LeavesPlant^{-1}was significant (P<0.05) as an effect of nutrient media (Table 4). The results showed that the maximum Number of Leaves in Plant^{-1}(443.33) was recorded in NM_3followed by (348.33 and 248.00) recorded in NM_4 and NM_2respectively. Whereas the minimum Number of Leaves Plant^{-1} (220.0) was noted in NM_1 nutrients media.

Length of Leaves (cm):

The analysis of Variances showed that the length of leaves (cm)was significant (P<0.05) as an effect of nutrient media(Table 4).The results showed that the maximum Length of Leaves(0.53cm) was recorded in NM_3=followed by (0.40 cm and 0.36cm) recorded in NM_4 and NM_2 .Whereas the minimum Length of Leaves(0.21cm) was noted in NM_1nutrients media.

Width of Leaves (cm):

The analysis of Variances showed that the width of leaves (cm)was significant (P<0.05) as an effect of nutrient media(Table 4).The results showed that the maximum Width of Leaves(0.30cm) was recorded in NM_3followed by (0.24 cm and 0.21cm) recorded in NM_4 and NM_2respectively. Whereas the minimum width of leaves (0.19cm) was noted in NM_1 nutrients media.

Root Depth (cm):

The analysis of Variances showed that the root depth (cm) was significant (P<0.05) as an effect of nutrient media (Table 4). The results showed that the maximum Root Depth (26.90cm) was recorded in NM_3 followed by (22.83 cm and 22.76 cm) recorded in NM_2 and NM_4respectively. Whereas the minimum root depth (12.46cm) was noted in NM_1 nutrients media.

Table 4. Number of Leaves Plant^{-1}, Length of Leaves (mm), Width of leaves (mm) and Root Depth (cm) in Acacia under various nutrient media.

Nutrient Media	Number of Leaves Plant^{-1}	Length of leaves (mm)	Width of leaves(mm)	Root Depth (cm)
NH_1Canal Silt	248.00 c	0.21 d	0.19 d	12.46 d
NH_2 Canal Silt+FYM (1:1)	220.00 d	0.36 c	0.21 c	22.83 b
NH_3 Canal Silt + Rice Husk(1:1)	443.33 a	0.53 a	0.30 a	26.90 a
NH_4Canal Silt + Dry leaves (1:1)	348.33 b	0.40 b	0.24 b	22.76 c
SE ±	24.602	0.0842	0.0448	2.2249
LSD 0.05	56.733	0.1941	0.1034	5.1305
P-Value	0.0001	0.0342	0.1738	0.0011
F-Value	34.2	4.78	2.14	15.30
CV	9.57	27.19	23.21	12.83

Fresh Biomass of Shoot (g):

The analysis of Variances showed that the fresh biomass of shoot (g) was significant (P<0.05) as an effect of nutrient media(Table 5).The results showed that the maximum Fresh Biomass of Shoot(30.27g) was recorded in NM_3followed by (21.98g and 16.43g) recorded in NM_4 and NM_2 respectively. Whereas the minimum fresh biomass of shoot (14.00g) was noted in NM_1 nutrients media.

Fresh Biomass of Root (g):

The analysis of Variances showed that the fresh biomass of root (g)was significant (P<0.05) as an effect of nutrient media(Table 5).The results showed that the maximum Fresh Biomass of Shoot(7.28g) was recorded in NM_3 followed by (6.88g and 4.88g) recorded in NM_4 and NM_2 respectively. Whereas the minimum fresh biomass of shoot (3.62g) was noted in NM_1 nutrients media.

Dry Biomass of Shoot (g):

The analysis of Variances showed that the dry biomass of shoot (g) was significant (P<0.05) as an effect of nutrient media (Table 5).The results showed that the maximum dry biomass of shoot (14.15g) was recorded in NM_3 followed by (9.87g and 6.07g) recorded in NM_4 and NM_2 respectively. Whereas the minimum dry biomass of shoot (4.04g) was noted in NM_1nutrients media.

Dry Biomass of Root (g):

The analysis of Variances showed that the dry biomass of root (g) was significant ($P<0.05$) as an effect of nutrient media (Table 5).The results showed that the maximum Dry Biomass of Shoot (3.20g) was recorded in NM_3 followed by (2.10g and 1.94g) recorded in NM_4 and NM_2 respectively. Whereas the minimum dry biomass of root (0.81g) was noted in NM_1 nutrients media.

Quality Index (QI):

The analysis of Variances showed that the Quality Index (QI) was significant ($P<0.05$) as an effect of nutrient media (Table 5).The results showed that maximum Quality Index(0.78) was recorded in NM_3 followed by (0.59 and 0.42) recorded in NM_4 and NM_2 respectively. Whereas the minimum Quality Index (QI) (0.33) was noted in NM_1 nutrients media.

Table-5 Fresh Biomass of Shoot (g), Fresh Biomass of Root (g), Dry Biomass of Shoot (g), Dry Biomass of Root (g) and Quality Index (QI) in Acacia under various nutrient media.

Nutrient Media	Fresh Biomass of Shoot (g)	Fresh Biomass of Root (g)	Dry Biomass of Shoot (g)	Dry Biomass of Root (g)	Quality Index (QI)
NH_1Canal Silt	14.00 d	3.62 d	4.04 d	0.81 d	0.33 d
NH_2 Canal Silt+FYM (1:1)	16.43 c	4.88 c	6.07 c	1.94 c	0.42 c
NH_3 Canal Silt + Rice Husk(1:1)	30.27 a	7.28 a	14.15 a	3.20 a	0.78 a
NH_4Canal Silt + Dry leaves (1:1)	21.98 b	6.88 b	9.87 b	2.10 b	0.59 b
SE ±	2.4404	0.8241	1.23	0.4	0.11
LSD 0.05	5.6275	1.9005	2.85	0.93	0.2537
P-Value	0.0007	0.0067	0.0002	0.0027	0.0156
F-Value	17.5	8.69	26	11.70	6.47
CV	14.46	17.80	17.73	25.51	25.26

DISCUSSION

Successful germination and planting of seedlings is an important step to protect and expand plant communities (de Melo et al., 2015). An important part of the success of the planting scheme is obtaining sufficiently high-quality seedlings. However, current studies have shown that growth parameters (germination and growth), as well as the use of various methods of processing pots and potted plants, take into account the type and size of the plant. However, current studies show that the maximum height of an Acacia seedling in 3 months found in a plastic bag the height of seedlings reaches (37 cm) and (136.2 cm) at the age of 8 months. Similarly, the study revealed the greatest root depth (38.1 cm) and neck diameter (9.5 mm) during T4 treatment (Venkatesh et al., 2002). In plastic bags with a diameter of 25 cm and 15 cm, the approximate diameter of the neck of a 5-month-old acacia seedling is maximum (7 mm) and is not confirmed by this study. The maximum number of knots (70) is also present in plastic bags with a diameter of 20 cm and 15 cm. This is because T4 contains a large amount of nutrient medium, which provides a large amount of nutrients for seedlings (Hossain et al., 2009). In the case of receipt of dry matter, the maximum dry biomass (26.10 g) and the minimum dry biomass of roots (6.80 g) were also recorded at the same T4. However, the results also coincided (Venkatesh et al., 2002). The World Health Organization reports that the maximum dry weight of shoots and roots of 5-month-old acacia seedlings is (6.68 g and 3.42 g) in plastic bags measuring 25 cm and 15 cm, respectively. In addition, it was also found that as the volume of plastic bags increased, so did the value of fresh and dry ingredients (Who and Consultation, 2003).

As in germination characteristics, sowing depth significantly influenced seedling height and number of emerging branches of *A. senegal* seedlings grown on pots filled with different soil substrates. The decline in seedling growth parameters with increasing sowing depth generally reflects the slow rate of seed germination at increasing depths which later translates into a retarded seedling growth rate. Generally, sowing depth that promotes the higher germination percent or faster rate of germination allows early seedling establishment and better seedling growth (Ren et al., 2002).

The result of this study reveals that growing media has no significant effect on the germination characteristics of *A. senegal* seeds, however forest soil (M2) yielded better germination percent and completeness in seed germination than sand (M3) and farm soil (M1). Among the seeds sown in each media at all depths 62.04% of seed germination was found for seeds sown on M2, 50.93% on M3 and 49.07% on M1. Also PV was found to be higher in M2 followed by M3. These differences in germination promotion among soil substrates might be related to differences in moisture holding capacity and soil aeration of the different soil substrates. The composition of M2 with high proportion of forest soil might have increased the water holding capacity and improved aeration of the soil. Increased availability of moisture in M2 should have extended imbibition of water by the seeds and improved total germination. Following the same pattern as in germination characteristics, mean values of seedling height and branch number (averaged across pretreatments and depth) were higher for seedlings grown on M2 than M3 or M1. Better seedling growth on M2 could also be the result of better soil physical characteristics (e.g. water holding capacity) and possibly nutrient conditions. Moreover, M2 (with 3:2:1, forest soil: farm soil: sand proportion) should have provided a better soil porosity, together with soil moisture and nutrient, that increased seedling growth. According to Elbrese et al. (2003) appropriate moisture and sufficient aeration are more important for growth performances of seedlings at the early growth stages than the nutrient levels. Wakjira (2007) observed slow growth of *C. macrostachys* seedlings grown in soil-dung mixture with no sand and attributed the slow seedling growth to low porosity and poor drainage conditions of the soil. In fact variations in growth response to different soil conditions may exist among seedlings of different species. The result of the present study reveals that *A. senegal* seedlings preferred forest soil > sand > farm soil for their growth. Investigated growth of seedlings of three different Acacia species on sand, loam and clay soils. They found out that *A. horrida* prefers loam and sandy soils; *A. seyal* has a similar preference it grows better on sand soils while *A. nubica* responded well in sandy and loam soils (Sanchez-Bayo and King, 1994).

CONCLUSION

The summarized result of the data determined that Various Nutrient Media had a positive and significant influence on the germination growth and development of Acacia. However, based on findings the present study has been conducting that the germination growth and development of Acacia is better nourished with Various Nutrient Media such as canal silt + rice husk (1:1).

AUTHOR CONTRIBUTIONS

All authors contributed equally to this research.

COMPETING OF INTEREST

The authors declare no competing interests.

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