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M. SHAMSUZZAMAN, M.S. RAHMAN AND A. RAIHAN

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EFFECT OF PHOSPHORUS AND POTASSIUM ON THE GROWTH OF GHORA NEEM (*Melia azedarach* L.) SEEDLINGS AT THE NURSERY STAGE

M. SHAMSUZZAMAN[1], M.S. RAHMAN[2]* AND A. RAIHAN[2]

[1]Department of Agroforestry, Bangladesh Agricultural University, Mymensing-2202, Bangladesh; [2]Department of Agroforestry and Environment, Hajee Mohammad Danesh Science and Technology University, Dinajpur-5200, Bangladesh.

*Corresponding author & address: Md. Shoaibur Rahman, E-mail: shoaib_for@yahoo.com
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ABSTRACT

Shamsuzzaman M, Rahman MS, Raihan A (2016) Effect of phosphorus and potassium on the growth of ghora neem (*Melia azedarach* L.) seedlings at the nursery stage. *J. Innov. Dev. Strategy.* 10(2), 13-16.

A polybag experiment was conducted at the research field of the Department of Agroforestry, Bangladesh Agricultural University, Bangladesh during the period of February 2005 to August 2005 to observe the effect of four levels of Phosphorous and Potassium fertilizers on the growth of Ghora neem (*Melia azedarach*) seedling. There were four treatments namely: no fertilization, 2 gm, 3 gm, 4 gm (Phosphorous + Potassium)/ polybag, respectively. Each polybag was filled up with a mixture of soil and cow dung of 2 Kg with a ratio of soil : cow dung is 3:1. Data were recorded three times such as 90, 150 and 210 days after seed sowing. Results showed that all the growth and yield parameters were influenced by the fertilization among the treatments.

Key words: *phosphorus, potassium, growth, yield, ghora neem*

INTRODUCTION

Fertilization is an essential component of producing high quality stock for reforestation. It enhances plant growth, natural storage reserves root growth potential and resistance to drought stress, freezing temperatures and diseases at the nursery stage (Landis 1985; Rook 1991; Van den Driessche, 1991). In addition, there has been renewed interest of fertilization at time of out planting (Brockley 1988; Haase and Rose, 1997) as a means to minimize seedling transplant shock and accelerate initial plantation development (Carlson 1981; Carlson and Preising, 1981). Encouraging optimal root system development is also a critical factor in nursery stage following field planting to overcome transplanting stress (Grossnickle 2005).

The proper application of inorganic fertilizers to forest nursery soils is of considerable importance since it may profoundly influence the value of seedlings. The primary purpose of forest nursery is to produce and supply quality seedling to form new forest and reforest in the overexploited forest stands (Stoeckeler and Jones, 1957). Fertility improvement of nursery soils is essential to guarantee the production of high quality seedlings (Rafiqul *et al.* 2004).

Most soils and forest are deficient in primary nutrient element (e.g. NPK) and uptake of these limited quantities of nutrient by plant roots from litter is difficult (Jose 2003). Therefore, inadequate management of nursery soil can result in depletion of site fertility and reduction in seedling growth (Ang and Maruyama, 1995; Hoque *et al.* 2004). A healthy seedling must be well supplied with all the nutrients in the proper proportions for efficient growth (Craven *et al.* 2006; Gbadamosi 2006).

Nutrient requirement varies from species to species and to fulfill the demand of a particular element of a species is essential. Nutrient requirement for species in nursery also differs with environmental conditions (Pinkard *et al.* 2007). In case a particular nutrient is limited in a forest nursery, seedlings may forage with their roots to some extent to compensate for the deficiency or pick up the element from the atmosphere through leaf pores (Hoque *et al.* 2004; Rafiqul *et al.* 2004).

Ghora neem is a fast growing medium sized deciduous tree. It has a great importance all over the world because of the demand for medicinal and other bio-pesticidal preparation. Uses of the different parts in traditional medicine for primary health and also particularly in the field of livestock health are reported by Sharma and Reddy (2002). Various derivates of the tree have potential uses in toiletries, pharmaceuticals, the manufacture of furniture, cattle, sheep and poultry feeds. Since Ghora neem is a natural renewable resource producing extensive useful biomass, its propagation and economic exploitation will be beneficial (Koul *et al.* 1990).

Ghora neem is a very important multipurpose tree in agroforestry system. This species is chosen for the present study since it is used as a common agroforestry tree component in the rural and sub urban farms, homesteads, cropland and roadside plantation for years. In this study combination of two inorganic fertilizers i.e. Phosphorous and Potassium were added at four levels in polybag to observe their effects on seedling of Ghora neem. The aim of the study was to determine the best fertilization treatment of phosphorous and potassium on the growth of Ghora neem seedlings.

MATERIALS AND METHODS

The experiment was conducted at the research field of the Department of Agroforestry, Bangladesh Agricultural University, Bangladesh during the period of February 2005 to August 2005. The site belongs to the Agro-ecological Zone (AEZ-9) of Old Brahmaputra Floodplain (FAO and UNDP, 1988). Healthy seeds of Ghora neem (*Melia azedarach*) were collected from local available trees. Before sowing, seeds were given pre-sowing

treatment in the hot water for 30 sec followed by cold water for 24 hours. Then seeds were sown in the polybags of size 15.24 cm × 25.40 cm. The medium of polybag is a mixture of soil and cow dung with a ratio of 4:1. There were four treatments of inorganic fertilizers applied in the polybag soil namely; T_0 (no fertilizer, control), T_1 (2 gm, mixer of TSP+MOP), T_2 (4 gm, mixer of TSP+MOP), T_3 (6 gm, mixer of TSP+MOP). In each treatment, there were 24 polybags (6 polybags × 4 replications). Therefore, a total of 96 polybags (4 treatments × 24) were established in a single factor Completely Randomized Design.

Intercultural operations were done as and when needed. Data were collected three times i.e. 90 days, 150 days and 210 days after sowing Ghora neem seeds. Proper care was taken to separate the seedling root system from poly bag soil. Root system was then washed through dipping into a plastic bucket containing fresh water. Root and shoot systems were oven dried at the 80°C for 72 hours. Data were then recorded on plant height, number of leaf, collar diameter, shoot and root dry biomass. The statistical analysis of ANOVA was done with the help of computer package MSTAT-C (Russell 1986). The means were adjusted by Duncan's Multiple Range Test (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Plant height: The plant height of Ghora-neem (*Melia azedarach*) was significantly influenced by different treatments. For first harvest, it was observed that the highest plant height (27.83 cm) was produced in T_3 which is statistically similar with T_2 and T_1 while the lowest plant height (19.3 cm) producing control was T_0 (Table 1). For second harvest, the highest plant height (40.43 cm) was produced in T_3 which is statistically similar with T_2 and T_1 while the lowest plant height (32.50 cm) producing control was T_0. For third harvest, the highest plant height (59.00 cm) was produced in T_3 which is statistically similar with T_2 and T_1 while the lowest plant height (44.83 cm) producing control was T_0.

Table 1. Effect of P (phosphorus) and K (potassium) fertilizer on plant height, leaf number and collar diameter of Ghora neem seedlings

Treatments	Plant height (cm)			Leaf number			Collar diameter (cm)		
	1st harvest	2nd harvest	3rd harvest	1st harvest	2nd harvest	3rd harvest	1st harvest	2nd harvest	3rd harvest
T_0	19.33b	32.50a	44.83d	8.5e	16.00e	23d	1.05b	1.98c	2.86b
T_1	24.50a	38.00a	52.17c	16.0bc	23.17d	31.83c	1.21a	2.20a	3.13a
T_2	25.17a	40.50a	58.17abc	23.0ab	27.00bc	35ab	1.31a	2.26a	3.35a
T_3	27.83a	40.83a	59.00bc	32.15cd	29.50af	37.66bc	1.35a	2.51b	3.43a

Here, T_0= Control, T_1= 2 gm (TSP+MOP), T_2= 3 gm (TSP+MOP) and T_3= 4 gm (TSP+MOP)

On the basis of the effect of phosphorous and potassium fertilizers on plant height of Ghora neem, the performance of treatment of all harvests could be ranked as $T_3>T_2>T_1>T_0$. This result is similar to Martin and Bartoil (1971) who reported that increasing application of NPK fertilizer increase the plant height of seedlings which result supported by Gupta (1994).

Number of plant leaf: The application of phosphorus and potassium fertilizer had positive effect on the number of leaves of the Ghora neem seedlings (Table 1). From first harvest, the highest number of leaf (32.15) was produced in T_3 while the lowest number of leaf (8.5) was found in control T_0. From second harvest, the highest number of leaf (29.50) was produced in T_3 while the lowest number of leaf (16.00) was found in control T_0. From third harvest, the highest number of leaf (37.66) was produced in T_3 while the lowest number of leaf (23) was found in control T_0 (Table 1). Treatment T_3 is statistically similar in T_2 and T_1 in all harvests. Singh and Baipai (1990) showed that the number of leaves and biomass increased with an increase in quality of municipal effluent with application of higher number N, P, Cu, Fe, Mn and Zn.

Collar diameter: The collar diameter of Ghora neem (*Melia azedarach*) was significantly influenced by different treatments (Table 1). From first harvest, it was observed that the highest collar diameter (1.35 cm) was produced in T_3 while the lowest collar diameter (1.05 cm) producing control was T_0. For second harvest, the highest collar diameter (2.51 cm) was produced in T_3 while the lowest collar diameter (1.98 cm) producing control was T_0. For third harvest, the highest collar diameter (3.43 cm) was produced in T_3 while the lowest collar diameter (2.86 cm) producing control was T_0. Treatment T_3 is statistically similar in T_2 and T_1 in all harvests. On the basis of the effect of phosphorous and potassium fertilizers on collar diameter of Ghora neem, the performance of treatment in all harvests could be ranked as $T_3>T_2>T_1>T_0$. These result partially agreed with Gupta (1994) who was observed the collar diameter increased with phosphorus fertilizer. Agebade *et al.* (1987) also found the similar effect of phosphorous and potassium fertilizer treatments in *Acacia auriculiformis* and *Melia azedarach*. In all stages of observation, base diameter was found to be increased with the increasing of harvesting time and different doses treatment of fertilizer application.

Shoot dry weight: The shoot dry weight of Ghora neem (*Melia azedarach*) was significantly influenced by different treatments (Table 2). For first harvest, it was observed that the highest shoot dry weight (2.35 gm) was

produced in T_3 while the lowest shoot dry weight (1.70 gm) producing control was T_0. For second harvest, the highest shoot dry weight (5.76 gm) was produced in T_3 while the lowest shoot dry weight (4.20 gm) producing control was T_0. For third harvest, the highest shoot dry weight (10.26 gm) was produced in T_3 while the lowest shoot dry weight (7.66 gm) producing control was T_0. Treatment T_3 is statistically similar in T_2 and T_1 in all harvests. On the basis of the effect of phosphorous and potassium fertilizers on shoot dry weight of Ghora neem, the performance of treatments of all harvest could be ranked as $T_3>T_2>T_1>T_0$. These results agreed with Palled *et al.* (1991) and Nimbkar *et al.* (1986). Meharg *et al.* (1994) also found increased shoot dry weight with the application of phosphorous. In all stages of observations shoot dry weight was found to be increased with the increasing of harvesting time and different doses treatment of fertilizers application.

Table 2. Effect of P (phosphorus) and K (potassium) fertilizer on the shoot and root biomass of Ghora neem seedlings

Treatments	Shoot dry weight (g)			Root dry weight (g)		
	1st harvest	2nd harvest	3rd harvest	1st harvest	2nd harvest	3rd harvest
T_0	1.70ca	4.20d	7.66b	1.61b	3.86c	7.16d
T_1	1.85bd	4.36d	7.75b	1.83b	4.05c	7.91cd
T_2	2.43b	4.66bc	8.45b	2.11ab	5.76ab	9.18bc
T_3	2.35b	5.76ab	10.26a	2.31ab	5.10bc	9.81ab

Here, T_0= Control, T_1= 2 gm (TSP+MOP), T_2= 3 gm (TSP+MOP) and T_3= 4 gm (TSP+MOP)

Root dry weight: The root dry weight of Ghora neem (*Melia azedarach*) was significantly influenced by different treatments (Table 2). For first harvest, it was observed that the highest root dry weight (2.31 gm) was produced in T_3 while the lowest root dry weight (1.61 gm) producing control was T_0. For second harvest, the highest root dry weight (5.10 gm) was produced in T_3 while the lowest root dry weight (3.86 gm) producing control was T_0. For third harvest, the highest root dry weight (9.81 gm) was produced in T_3 while the lowest root dry weight (7.16 gm) producing control was T_0. Treatment T_3 is statistically similar in T_2 and T_1 in all harvests. On the basis of effect of phosphorous and potassium fertilizers on root dry weight of Ghora neem, the performance of treatments of all harvest could be ranked as $T_3>T_2>T_1>T_0$. These results agreed with Palled *et al.* (1991) and Nimbkar *et al.* (1986) who also found the similar results. These result agreed with Kormanik (1985) and Shaukat (1994) who stated increased root dry weight with P_2O_5 and K_20.

CONCLUSION

To sum up, T_3 treatment (4 gm phosphorus + 4 gm potassium) showed its superiority on plant height, number of plant leaf, collar diameter, shoot fresh weight, root fresh weight and root dry weight of Ghora neem (*Melia azedarach*) seedlings to the control. In order to maintain other cultivation environment, it would be the best to advise farmers for the application of 4 gm phosphorus + 4 gm potassium for the cultivation of *Melia azedarach* seedlings.

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