Tropical Agricultural Research and Extension 7, 2004

Effect of fertilizer application in nursery for elite seedling production of Pungam (*Pongamia pinnata* L. Pierre)

*Jerlin, R. And K.K.Vadivelu
Department of Seed Science and Technology, Tamil Nadu Agricultural University, Coimbatore-641003, TN, India

Accepted 30th May 2004

ABSTRACT

To obtain a good quality planting stock of pungam (*Pongamia pinnata* L. Pierre) in the nursery, a poly pot nursery trial was conducted with different doses of N,P and K in selected combinations along with control. The results revealed that the application of N,P and K @ 375 :250:125 mg plant^{-1} in poly pot in the nursery was the optimum fertilizer dose for getting maximum root and shoot length and dry weight of seedlings. For all these observed characters, the control treatment recorded the lowest value.

Key words: Pungam, nursery, fertilizer application, quality planting stock.

INTRODUCTION

Pungam (*Pongamia pinnata* L. Pierre) (Honge in Hindi) the multipurpose tree, assumes paramount importance because of its cost effective oil which is competitive with diesel, suitability in the afforestation programme, biopesticidal properties of leaves and medicinal value of almost all parts of the tree. For successful propagation of this tree, supply of good quality planting stock is of prime importance. The establishment and survival of the planting stock in the field are mainly dependent on the production of good quality planting stock which is mainly influenced by the size and vigour of the seedlings produced in the nursery (Venkatesh, 2000). The nursery soil after raising of seedlings repeatedly gets depleted of its nutrients such as N,P,K due to the uptake by the plants (Mustanoja and Leaf, 1965). The nutrients are also leached off during rains. These are not sufficiently compensated by the addition of inorganic fertilizers. Since nursery stock is to be made ready within a limited period of time and healthy seedlings are always a must for the success of plantation programmes, to raise such seedlings, substitution of the impoverished soil with inorganic fertilizer is a well known procedure. This method has been tried with different dosage combination of N,P and K in producing elite seedlings of pungam. Hence, standardization of optimum fertilizer dose in nursery is highly warranted.

MATERIALS AND METHODS

Bulk seeds of pungam, immediately after harvest and threshing from pods were cleaned, graded dried and were sown in the poly pots of 30 x 10 cm dimensions with pot mixture @ soil: sand : FYM in 1:1:1 ratio at the rate of one seed per pot. The nutrients viz., N,P and K were applied as per the following treatments, which were replicated 5 times.

T_1 $N_0P_0K_0$	T_7 $N_2P_1K_2$	T_{13} $N_3P_2K_2$
T_2 $N_1P_1K_1$	T_8 $N_2P_2K_1$	T_{14} $N_4P_1K_1$
T_3 $N_1P_1K_2$	T_9 $N_2P_2K_2$	T_{15} $N_4P_1K_2$
T_4 $N_1P_2K_1$	T_{10} $N_3P_1K_1$	T_{16} $N_4P_2K_1$
T_5 $N_1P_2K_2$	T_{11} $N_3P_1K_2$	T_{17} $N_4P_2K_2$
T_6 $N_2P_1K_1$	T_{11} $N_3P_1K_1$	

(N_1 125 mg plant^{-1} P_1 125 mg plant^{-1}
N_2 250 mg plant^{-1} P_2 250 mg plant^{-1}
N_3 375 mg plant^{-1} K_1 125 mg plant^{-1}
N_4 500 mg plant^{-1} K_2 250 mg plant^{-1})

Full dose of P and K and half of the dose of N were applied basally at the time of sowing of seed in poly pots, while remaining half dose of nitrogen was applied after 25 days of sowing. Watering and weeding were done as and when required. Two months after sowing, the seedlings from each treatment and replication were pulled out and the observations viz., shoot height (cm), root length (cm) and dry weight of the seedling (mg), were recorded and the observed data were statistically analyzed in Factorial Completely Randomized Block Design as per the procedure

*Corresponding author

described by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

In the present study, significant differences were obtained among different N, P and K levels, their interactions and control Vs rest for shoot height, root length and dry weight of the seedlings (Table 1-3).

Table 1. Effect of fertilizer application in the nursery on shoot height (cm) of seedling

P K Levels	N Levels					
	N_1	N_2	N_3	N_4	Mean (PxK)	Mean (P)
P_1 K_1	14.7	16.6	15.9	18.7	16.4	16.2
K_2	13.6	17.1	15.6	17.2	15.9	
Mean (NxP)	14.1	16.9	16.8	18.0		
P_2 K_1	18.1	16.8	19.1	17.5	17.9	17.7
K_2	17.8	15.8	18.8	17.5	17.5	
Mean (NxP)	17.9	16.3	18.9	17.5		
Mean (N)	16.1	16.6	17.4	17.7		
Control	15.5		Rest	16.9		
Critical Difference (P=0.05)	N 0.50	P 0.35	K 0.35	N*P 0.71	N*K 0.71	P*K 0.50	N*P*K 1.00	Control vs Rest 0.73

As far as the shoot height is concerned, among different N levels, N_4 registered the maximum shoot height (17.7 cm) and N_1 recorded the minimum length (16.0 cm). Between P levels, P_2 recorded more (17.6 cm) and between K levels, K_1 was superior (17.1 cm) to K_2 (16.6 cm). In the N x P interaction, at all levels of N, P_2 was the best and in N x K interaction, at all levels of N_1, K_1 was the best. In P x K interaction at all levels of P_1, K_1 performed better. The three way interaction was also significant. The control treatment recorded the least value of 15.5 cm.

For root length at all N levels, N_3 recorded the lengthiest root (19.1 cm) which was on par with N_4 (18.5 cm) and the shortest by N_2 (17.2 cm). Between P levels, P_2 recorded lengthier (18.7 cm) compared to P_1 (17.6 cm) and in K levels, K_2 was superior (18.2 cm) to K_1 (18.1 cm) but both were on par. In the N x P interaction, at all levels of N_1, P_2 was the best except N_2. In N x K interaction, at N_1 and N_4, K_1 was the best and in N_2 and N_3, K_2 performed better. In P x K interaction at P_1 and P_2 both K_1 and K_2 were on par.

Table 2. Effect of fertilizer application in the nursery on root Length (cm) of seedling

P K Levels	N Levels					
	N_1	N_2	N_3	N_4	Mean (PxK)	Mean (P)
P_1 K_1	17.1	17.0	17.8	19.0	17.7	17.6
K_2	17.6	17.9	17.2	17.9	17.6	
Mean (NxP)	17.3	17.4	17.5	18.4		
P_2 K_1	18.9	16.9	20.1	18.7	18.6	18.7
K_2	18.2	17.3	21.4	18.5	18.8	
Mean (NxP)	18.5	17.1	21.7	18.6		
Mean K_1	18.0	16.9	18.9	18.8	18.1	
(NxK) K_2	17.9	17.6	19.2	18.2	18.2	
Mean (N)	17.9	17.2	19.1	18.5		
Control	17.4		Rest-18.2			
Critical Difference (P=0.05)	N 0.28	P 0.20	K 0.20	N*P 0.39	N*K 0.39	P*K 0.28	N*P*K 0.56	Control Vs Rest 0.41

N_4 produced maximum dry weight (113 mg) which was on par with N_3 (112 mg) and the minimum was recorded by N_1 (104 mg). Between P levels, P_2 was superior (113 mg) and in K levels, both K_1 and K_2 were on par. In N x P interaction, at N_1 and N_3, P_2 was more and at N_2 and N_4, P_1 recorded more. In N x K interaction, at N_1 and N_4, K_1 was superior and at N_2 and N_3, K_2 recorded more. In P x K interaction, at both levels of P, K_1 and K_2 were on par. The control recorded the minimum (101 mg) and was significantly different from the rest (109 mg)

Application of inorganic fertilizers to improve the growth and development of the nursery stock of forest tree species has not yet been studied extensively. In the present study, application of N,P,K at 375, 250, 125 mg plant^{-1} enhanced the length of root and shoot length and dry weight of the seedlings. Similar research findings have been suggested by so many authors

In sylvicultural species. Switzer and Nelson (1963) suggested that 160 mg plant^{-1} was optimum N level for *Pinus taeda*. Application of N-375 and P-250 mg plant^{-1} induced maximum seedling length and vigour, while N-375, P-250 and K-250 mg plant^{-1} recorded maximum dry matter production in *Robinia pseudococia* (Bhardwaj et al., 1991). According to Mohinder *et al.*,(1991), application of NPK to the nursery Stock of *Dalbergia sissoo* increased the seedling

Table 3. Effect of fertilizer application in the nursery on dry weight (mg) of the seedling

P / K Levels		N Levels					
		N_1	N_2	N_3	N_4	Mean (PxK)	Mean (P)
P_1	K_1	101	104	103	117	106	106
	K_2	100	124	103	110	107	
Mean (NxP)		100	109	103	114		
P_2	K_1	110	105	119	115	112	
	K_2	106	104	121	108	110	111
Mean (NxP)		108	104	102	112		
Mean (NxK)	K_1	105	104	111	116	109	
	K_2	103	109	112	109	108	
Mean (N)		104	107	111	113		
Control		101		Rest-109			
Critical Difference (P=0.05)		N	P	K	N*P	N*K	P*K	N*P*K	Control Vs Rest
		2.58	1.82	1.82	3.64	3.64	2.57	5.14	3.75

height and number of intact leaves. Prasad and Rawat (1991) found that *Acacia nilotica* seedlings responded to N applied alone or in combination with P and K. In the present study, the control recorded lesser values for all the observed characters than the fertilizer applied plants. Hence, all the three nutrients viz., N,P and K should be applied in combination. Application of P and K alone or in combination decreased the growth, yield and fertilizer use efficiency in the absence of N (Thomas *et al.*, 1994). Hence, from the result of present study, for getting elite seedling or planting stock of pungam, the fertilizer dose recommended for nursery is @ 375 : 250 : 125 mg NPK plant^{-1}. The germination and survival of seedlings were also better by the application of above dosage of inorganic fertilizers.

REFERENCES

Bhardwaj, S.D., Sing, B.S. and Gupta, M.P. 1991. Effect of different levels of N,P,K on the growth of *Robinia pseudococia* seedlings. Indian For., 568-572.

Mohinder, B.B., Gupta and Raturi, D.P. 1991. Effect of gibberellin and fertilizers on growth of nursery stock of Dalbergia sisoo. Indian J. For., 14(3): 190-195.

Mustanoja, K.J. and Leaf, A.L. 1965. Forest f ertilization research, 1957-1964. Bot. Rev. 307:151-246.

Panse, V.G. and Sukhatme, P.V. 1985. Statistical methods for agricultural workers, I.C.A.R. Pub., New Delhi, pp. 327-340.

Prasad, K.G. and Rawat, V.R.S. 1991. Response of N,P and K by *Acacia nilotica* seedlings, Indian For., 560.

Switzer, G.L. and Nelson, L.E. 1963. Effects of nursery fertility and density on seedling characteristics, yield and field performance of loblolly pine. Soil Sci.Soc. Amer. Proc., 27: 461-464.

Thomas, M.B., Richards, B.A.J. and Sparway, M.I. 1994. The influence in nutrition of foliage growth and tip necrosis on container grown *Chamaecyparis lawsoniana* comb. Proc. Intern. Pl.Prop. Soc., 43: 350-356.

Venkatesh, A. 2000. Studies on seed source variations, standardization of seed testing procedures and nursery techniques in Acacia nilotica (L.) Wild. Sup. Sp. *India* Benth. Ph.D. (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore.