

EFFECT OF IMPROVEMENT PRACTICES ON *DALBERGIA SISSOO* (SHISHAM) PLANTED IN ISLAMABAD

M. I. Sheikh & Abdul Aleem*

Summary

Dalbergia sissoo (shisham) is one of the most profusely planted trees in Islamabad. Yellowing of its foliage and subsequent death caused considerable alarm in the nations capital. A study was started in 16 and 6 year old blocks to find out if irrigation, spray with dieldrin and use of N.P. could improve the situation. The study was maintained for five years and was assessed recently. It was found that fertilizers improved the growth of 16 year old plants and hence resistance to the disease but none of the three treatments had any effect on the younger plants.

Introduction

Landscape designing has received a high priority in the development of Islamabad. Small block plantations of different ornamental as well as important timber species have been raised around Islamabad not only to beautify it but also to ameliorate weather conditions.

Shisham, (*Dalbergia sissoo*), is a very important timber species of Pakistan. The ease with which it can be grown, its comparatively fast rate of growth and low maintenance costs prompted the planners in Islamabad to plant it extensively. It was presumed that the tree being hardy and natural to the low foot hills had the best of chances.

However, couple of years back, yellowing of shisham plantations resulting ultimately in the death of trees was observed. It was attributed to shisham bark borer (*Agilus dalbergiae*) which normally attacks when the tree is in a poor state of growth. It was, therefore, possible that the trees were first weakened due to deficiency of water and nutrients predisposing them to the attack of the insect.

Poor rate of growth in shisham was attributed to a multitude of factors including drought, silvicultural mistreatment, lack of nutrients and the disease/insect attacks. To specify the cause of mortality two experiments were started simultaneously on plantations raised along Islamabad-Lahore Highway at km 11 (Kural) and 18 (Bhandar) in April 1974. Kural area supported 6 years old crop and Bhandar 16 year old. The sites were selected at random out of many shisham blocks showing yellowing of leaves and the signs of infestation by the bark borer.

Review of literature

Beeson (1941) reported *Agilus dalbergiae* and *A. birmanicus* as minor pests of shisham. Anderson (1960) reported that *Agilus* spp. attacked dying trees but sometimes they did kill healthy trees as well such as European varieties of white birch. In his opinion drought also

*Authors are Director General and Watershed Management Specialist in the Pakistan Forest Institute, Peshawar.

predisposed trees to attack causing partial to complete cessation of radial growth. He recommended that the trees should be kept in vigorous condition to save them from the attack. Arru (1962) found that *Agrilus viridis* appeared to attack poplar in first year after planting, particularly if weakened through lack of water, faulty planting, or unsuitable site, which included in particular sandy or gravelly or compacted soils. He suggested the attack could be prevented by proper early irrigation where necessary and choice of cultivars with vigorous root systems. Control of newly hatched larvae could be attained by spraying or brushing the attacked stem with parathion. Turcek, (1968) briefly discussed, with special reference to insects, the complex combination of factors that affected the resistance, (equated with vigour). These included selection and breeding, treatment of seed and planting stock, site factors, plant biochemistry and fertilizing.

Nichols, J.C. (1969) stated that the primary cause of crown dieback and mortality in the red oak group was defoliation by insects and by late spring frosts. He was of the view that an extended drought may have contributed indirectly to the mortality, but was not a direct cause. Trees that had been defoliated from 60–100% over 2-3 successive years were liable to be killed by *Agrilus bilineatus*.

Arru (1973) suggested that attack of *Agrilus suvorovi* *Popluneus* could be controlled by maintaining vigorous growth of the poplar plants. He was of the opinion that chemical control was costly because oviposition extended over more than two months necessitating several spray treatments.

The study

The study was started in May 1974 on two compact blocks of shisham plantation along Islamabad Lahore Highway for studying the effect of irrigation and nutrient application with insecticidal sprays on the health of trees. The treatments employed at each of the two places are as follows:

A. Bhadar—18 km from Islamabad on Islamabad highway bearing 16 year old shisham crop

- i. Major treatments: Each tree in major plots allotted to irrigation treatments was given a doze of 144 litres (8 tins) of water on 23.5.1974 and 21.6.1974.
- ii. Minor treatments: Each tree in minor plots allotted to spray treatment was sprayed with dieldrin with 0.5 percent concentration all along the stem of the tree. Spray was done on 15.6.1974, 16.7.1974, 2.8.1974 and 16.8.1974.
- iii. Sub-minor treatments: Each group of 5 trees in sub-minor plots allotted to fertilizer treatments was given dozes as under:

N – treatment : 1.4 kg of urea per tree

P – treatment : 1.7 kg of superphosphate per tree

N&P – treatment: 0.7 kg of urea + 0.9 kg of superphosphate per tree

Control: No fertilizer added.

Fertilizer was added in a one metre radius area of the tree, thoroughly worked in the soil. Irrigation was given after the addition of fertilizer.

B. Kural – 11 km from Islamabad with 6 year old crop

- i. Irrigation dose was reduced to half i.e., 72 litres instead of 144
- ii. No change was made in insecticidal spray treatment
- iii. Fertilizer doses were given as follows:

Nitrogen : 0.72 kg urea per tree
 Phosphorus : 0.13 kg superphosphate per tree
 Nitrogen & phosphorus : 0.35 kg urea and 0.07 kg superphosphate.

The experiments at both the places were laid out in a randomised complete block design replicated 3 times the size of the plot was kept as 3 trees at Bhandar and 5 trees at Kural.

Height and diameter measurements were recorded before starting the experiment.

The experiment was maintained for a period of 5 years when final measurements were recorded.

Results

After the start of the experiment 12 casualties occurred at Bhandar and 4 at Kural. Rest of the trees were in healthy condition. Growth measurements were recorded every year. Data on height and diameter increment after 3 growing season (23.5.1974 to 15.3.1977) and 5 growing season (23.5.1974 to 10.12.1978) were analysed. The results are presented below in Tables 1 and 2 for Bhandar and table 3 and 4 for Kural (Detailed data presented in Appendices I to IV).

12 trees died under the following treatments:

Fertilizer	Irrigated		Un-irrigated	
	Sprayed	Unsprayed	Sprayed	Unsprayed
Control	0	1	0	1
Nitrogen	2	0	1	1
Phosphorus	1	1	0	1
Nitrogen & phosphorus	1	1	1	0
Total :—	4	3	2	3

As is obvious from the data none of the treatments reduced mortality significantly.

Growth increment data for 3 years are presented below:

Table 1. Growth increments (from 25.4.1974 to 15.3.1977) at Bhandar.

Fertilizer	Irrigated		Un-irrigated	
	Sprayed	Unsprayed	Sprayed	Unsprayed
Diameter increment (centimetres)				
N	1.9	1.7	2.0	3.0
P	2.5	2.5	3.1	2.1
NP	2.5	2.5	1.9	2.2
C	2.2	1.8	2.0	1.9
Height increment (metres)				
N	2.1	1.8	1.5	2.4
P	1.3	1.6	1.7	1.1
NP	0.9	1.5	1.2	1.5
C	1.4	1.3	1.4	1.4

Height increment

The data indicate that the fertilizer treatments are highly significant, nitrogen from phosphorus (5% level) and from nitrogen and phosphorus (1% level) i.e., nitrogen gave conclusively better results than the other.

Nitrogen when applied without spraying had highly significant (1% level) effect on height growth.

Nitrogen and phosphorus when combined with dieldrin spray gave significantly poor (1% level) performance.

Irrigation had no significant effect on the growth of plants.

Diameter increment

The analysis of variance showed that fertilizer application when combined with irrigation gave significant results (5%). Nitrogen unirrigated gave the best performance followed by phosphorus unirrigated, phosphorus solo and combined with nitrogen, over the other treatments. Nitrogen irrigated, and control irrigated as well as unirrigated gave the poorest performance.

Measurements recorded in December 1978, given in Table 2 showed the following results

Table 2. Growth increments (from 25.4.1974 to 13.12.1978) at Bhandar

Fertilizer	Irrigated		Un-irrigated	
	Sprayed	Unsprayed	Sprayed	Unsprayed
Diameter increment (centimetres)				
N	4.0	2.7	3.3	3.9
P	4.5	3.5	4.1	3.1
NP	4.0	3.6	2.7	3.2
C	3.1	3.2	3.8	3.2
Height increments (metres)				
N	2.3	2.6	3.0	3.8
P	3.1	2.9	4.0	2.6
NP	2.7	3.6	2.4	2.9
C	1.6	2.8	3.6	3.1

Height : No significant effect was observed

Diameter : The application of fertilizer alone as well as combined with irrigation, spray and both had a significant effect (5% level) on the diameter growth.

Kural

Four trees were recorded as dead in the plantation after the start of the study. Mortality accrued as follows:

Irrigated, sprayed, unfertilized	= one
Un-irrigated, sprayed, unfertilized	= one
Un-irrigated, unsprayed, nitrogen fertilized	= two

Un-irrigated and unsprayed treatments seem to be more prone to the mortality of trees. Other trees were in healthy condition. Analysis of variance for diameter and height measurements on 15.3.1977 (Table 3) showed no significant differences after 3 growth seasons.

Table 3. Growth increments (from 23.5.1974 to 15.3.1977) at Kural

Fertilizer	Irrigated		Un-irrigated	
	Sprayed	Unsprayed	Sprayed	Unsprayed
Diameter increment (centimetres)				
N	3.0	3.5	3.3	3.3
P	3.0	3.4	3.0	3.3
NP	3.4	3.1	3.3	3.5
C	3.0	3.2	3.0	3.1
Height increments (metres)				
N	1.9	2.2	1.8	2.0
P	2.0	2.0	2.0	1.7
NP	1.8	1.9	2.0	2.1
C	1.9	2.0	1.8	2.0

Measurements recorded in December 1978 (Table 4) showed the following results:

Height: The application of fertilizer alone and its combination with irrigation, spray or both had a significant effect (5% level) on the height growth.

Diameter : No significant effect was observed.

Table 4. Growth increments (from 25.4.1974 to 13.12.1978) at Kural

Fertilizer	Irrigated		Un-irrigated	
	Sprayed	Unsprayed	Sprayed	Unsprayed
N	6.9	7.5	7.3	7.1
P	8.3	6.9	7.4	6.5
NP	7.4	6.5	7.5	7.3
C	6.9	6.9	5.5	6.6
Height increments (metres)				
N	5.0	4.7	4.9	4.2
P	5.1	4.6	5.2	4.0
NP	5.1	4.5	4.9	4.4
C	4.7	4.5	4.7	4.3

Conclusion

The irrigation, spray and fertilizer have no effect either singly or in combination on the growth and health of younger age shisham plantation. With increase in age fertilizer did show an effect on the growth. In mature or submature (16–20) years old plantations, fertilizer, and especially nitrogen had significant effect on growth. The treatment improved the vitality of the trees which showed better resistance to the problem during the study period. Least growth was attained by trees which were taken as control i.e. neither irrigated nor fertilized nor sprayed.

REFERENCES

- Anderson, R.F. 1960. "Forest and shade tree Entomology" pp. 249–51 John Wiley and Sons. Inc.
- Arru, G.M. 1962. The influence of soil conditions on the susceptibility of poplar to *Agilus viridis* var. *populnea* in Northern Italy. Fifth World Forestry Congress, Seattle. 1960. Proceedings. Vol. 2 (Sect 3 C), 1962:948:50.
- Arru, G.M. 1973. "An annotated list of insect causing damage of economical significance to poplar cultivation in Italy" IUFRO Working Party on Poplar Resistance to Insect held at Vienna (Austria).
- Beeson. 1941. "The ecology and control of Forest insects of India and neighbouring countries" pp. 589.
- Nichols, J.O. 1968. Oak mortality in Pennsylvania: a ten year study. U.S.J. For. 66(9): 681-694.
- Turcek, F.J. 1966. The resistance of planting stock to pests. Forest planzen—Fortsamen, Strassenhans. 3: 13–6.