REGENERATION TECHNIQUE IN CHIR PINE (*PINUS ROXBURGHI*) FORESTS

by

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Summary. *Chir-pine seedlings raised in polythene tubes have successfully been planted at the lower elevational limits of the chir-pine forests where natural regeneration had failed to establish. Planting in February and June gave equally good survival.*

Introduction. Chir forests cover an area of 3000 m. hectares. Natural regeneration is absent in most of the transition zone between the dry subtropical broad leaved forest and subtropical pine forest. Over a period of time this belt has been invaded by low quality shrubs and poor forage grasses. This has happened due to a combination of adverse biotic factors and technical mishandling. Artificial regeneration, if at all adopted, remained confined to sowing of *Pinus roxburghii*, *Dodonea viscosa* and *Acacia modesta* and the effort in general failed due to inadequate site preparation, lack of protection, and a poor follow-up.

Two sites were selected for this study: compartment 76(i) Angoori Block of Ghoragali Range and Margalla Hills, Islamabad.

Compartment 76: Altitude 1100-1400 metres above sea level, moderate to steep slope, aspect North-Eastern and South-Western, soil sandy-loam.

The compartment was placed in selection working circle in the 1927 working plan. Incendiary fires destroyed the vegetation badly in 1932. Since then efforts to regenerate the area naturally have failed.

Margalla Hills: A similar area was selected in Margalla Hills. The area used to be a private forest. The soil was much depleted and over-all retrogression had set in before it was brought under the control of the Capital Development Authority. The area was totally burnt in 1973 due to incendiary fires and was devoid of any vegetation at the time of laying out this experiment.

Review of Literature. Detringer (1972) has reported on the basis of a questionnaire circulated to commercial nurseries (in S. and S.W. Germany) that planting in March and early April was better than later in the spring. No preference among dates of autumn planting was expressed and autumn plantings were not considered inferior to spring plantings. Frisque (1975) pointed out that the date of planting (3 June—29 July) had no significant effect on the survival of *Pinus banksiana*. Kinnumen (1974) after conducting a number of experiments with *Pinus sylvestris* seedlings raised in paper pots in a plastic green house on different dates in 1971, 1972 and 1973 growing seasons concluded that in N. Finland the

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date of planting had no long term effect on early growing of container grown plants and that with careful handling seedlings may be planted safely throughout the summer. Shehurevich (1975) after test planting *Pinus sylvestris*, *Alnus glutinosa* and *Betula verrucosa* in autumn and spring on drained fans in West Russia obtained indicative results that autumn planting was quite unsatisfactory and that spring was the only possible time for effective planting in the region Pole's. (Belorussia/Ukraine).

Jakabby (1973) described results after two years of planting trials in Sweden with 2-R/O Scots pine (2 year seedlings undercut by a special method) and first year results with 3-R/O Scots pine and Norway spruce. The 2-R/O stock was superior to 2-year seedlings and transplants, and equal to 3-year transplants, in survival and growth. The 3-R/O Pine was equivalent to 3-year transplants, and the 3-R/O spruce was equal in survival but inferior in growth to 3-year transplants, and superior in survival and growth to 2+2 but inferior in growth to $2\frac{1}{2}+1\frac{1}{2}$ stock. A trial conducted in Chile to determine the effect of planting stock quality (large, medium and small plants) and planting season (July and September) showed that large plants grew best, and planting in late September was slightly superior to planting in early July (Burschel, 1973). *Pinus pinaster* and *Eucalyptus maidenii* planted at Tamaera (Mogods) in winter and spring showed no significant differences in seedling survival and growth. However, the need for further trials was emphasised (Ben Salem et al., 1974).

Pinus sylvestris seedlings raised in paper pots planted out from May to October in south eastern Sweden showed one year after planting that both spring and summer plantings survived well (80-90%) and it was, therefore, recommended that paper pot plants should be used to extend the planting season in this region (Delfin, 1974). Barnett (1974) reported that 1-month-old seedlings of *Pinus taeda* did better than the 2-month-old seedlings planted on dry and wet sites in Louisiana. Lohrey, R.E. (1973) reported that planted *Pinus taeda* and *P. elliottii* grew faster than direct sown pines on an upland site in Louisiana dominated by low quality hardwoods were killed by herbicide injection one year after planting or sowing the pines. For both species, the height difference in favour of the planted plots at 9 years of age was equivalent to about one year's growth and average diameters were also greater on the planted plots. *Pinus taeda* showed larger differences than *P. elliottii*. Kislova (1975) reported the results of observations made in several plantations of Scots pine 9 and 40 years old, made by direct sowing and by planting in W. Ukraine. Full details of cost have indicated that planting was superior to direct sowing both economically and in terms of growth performance.

Experimental Procedure. In 1975, identical studies were laid out at Angoori Block and Margalla Hills using the following treatments, replicated four times in a randomised complete block design with 25 seedlings for each treatment in each replication.

Major treatment:	Planting season
	February
	July
Minor treatment:	Age of seedling
	2 years
	3 years

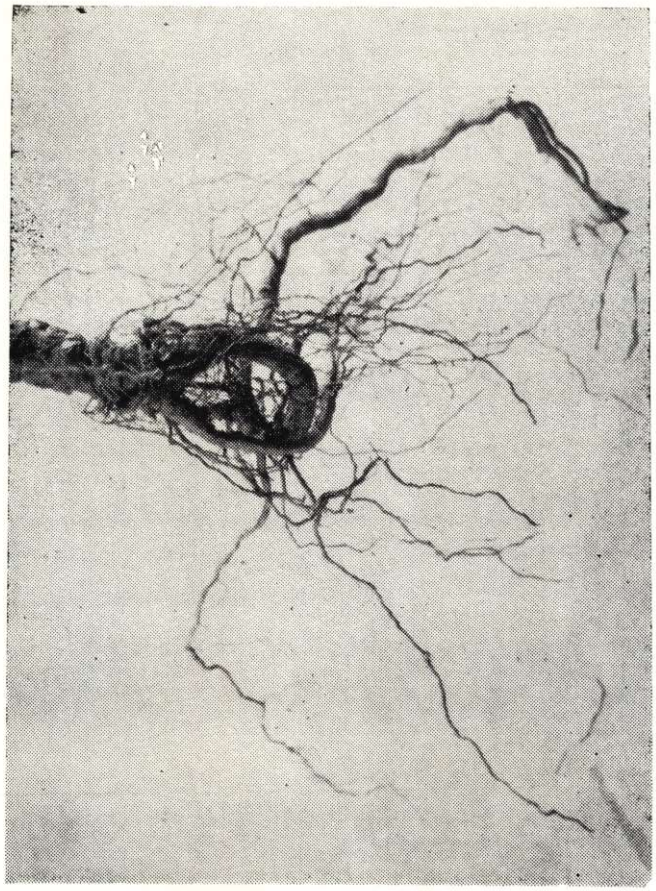


Fig. 2 Root system of the 3-year old tubes plant of chir pine after about 2 years of planting. There is a persistent twist in the main root system although fibrous root system is well developed.

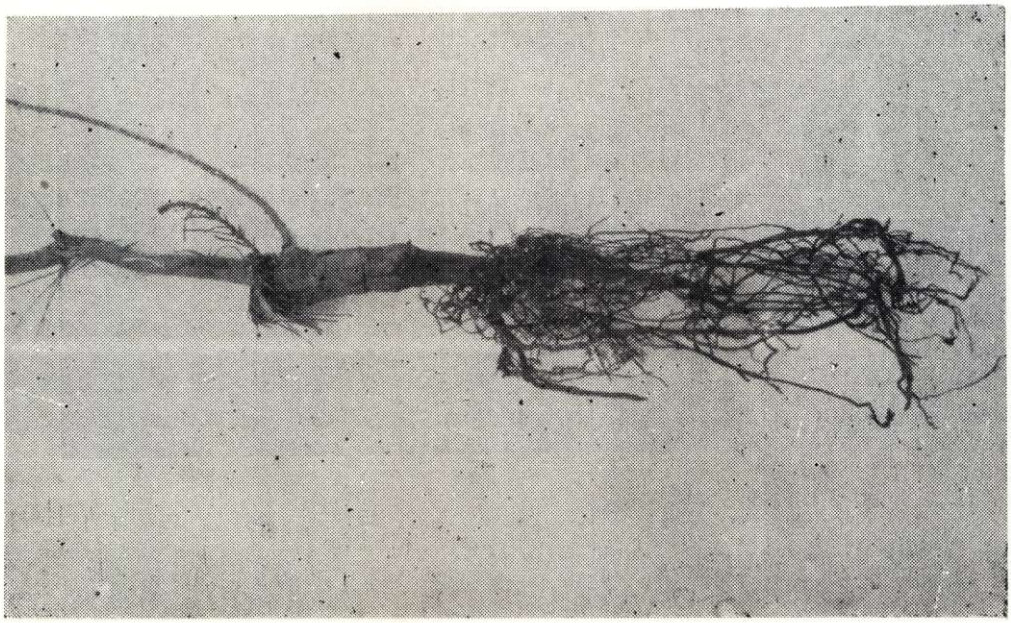
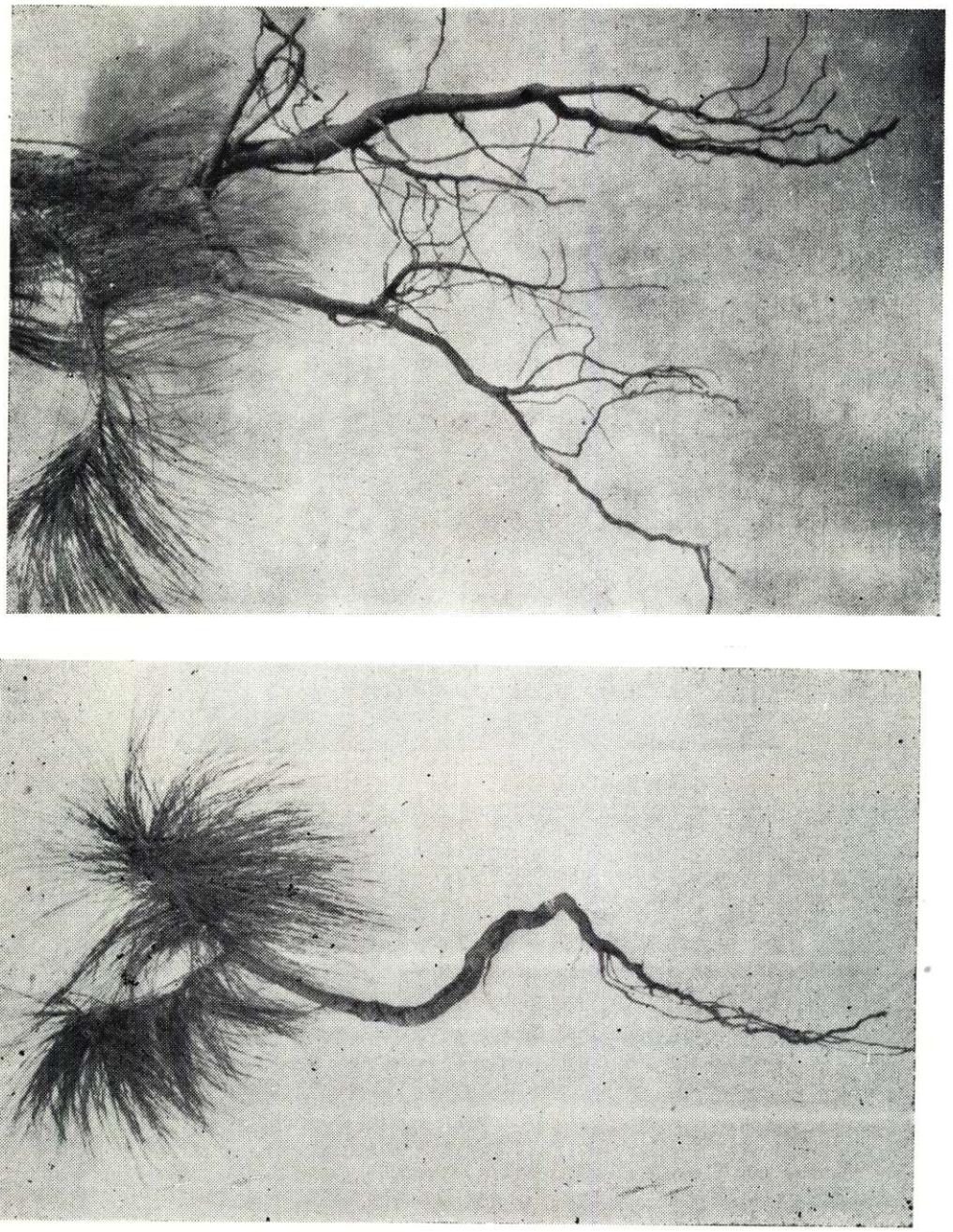


Fig. 1 Root Development of 3-year old tube plant of chir pine. There is distinct swelling at the collar.



Figs. 3 & 4 Root system of natural seedlings dug out from the forest. The tap root system is fully developed.

Tube stock of chir pine (*Pinus roxburghii*) raised in the research garden Peshawar was planted in 45 cm. deep pits at 1.8 x 1.8 metre spacing. In all 400 plants were planted. Planting was done just after a rain when the moisture was still available to the plants. No hand watering was given. Also no weedings were done in the area after planting.

Results and Discussions. On January, 1977, the range of survival percentages was as follows:

Location	Time of planting		Age of seedling	
	February	July	2 years	3 years
Angoori	82—96	86—94	88—92	84—98
Margalla	92—100	84—98	90—98	86—94

The experiment indicates that chir pine tube stock can be planted equally well in February as well as July.

Fritz Bergman et al., (1976) have warned against the risk of root deformation if pines are grown too long in containers with walls impervious to roots. Two three year old plants were dug up and compared with two plants of the same size from natural seed fall. The tube stock showed evidence of both root curl and abnormal swelling above root collar (see illustrations).

Conclusions.

1. Chir-pine tube stock can be planted equally well in February as well as July.
2. Using container stock it is possible to plant up even refractory sites.
3. To avoid the risk of failure of plantations through the effect of root curl, chir-pine should not be grown in polythene containers for more than 9 months.

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