

INTER-SPECIES GRAFTING OF CHALGHOZA PINE SCION-WOOD ON CHIR PINE ROOT – STOCK

Mohammad Khan¹

Abstract

Chalghoza pine (*Pinus gerardiana*) is an important forest cash crop, growing naturally in North-Western Himalayas and Suleman ranges of Pakistan. The chief value of the tree lies in its edible seeds. In order to bring chalghoza pine under clonal propagation at par with other fruit crops, efforts were made to graft scion-wood of this species on root stock of chir pine, which has proved successful. This paper presents results of two experiments conducted for the purpose.

Introduction

Pinus gerardiana Wall. (Chalghoza pine) is an edible pine nut of North-Western Himalayas. In Pakistan, it is found in Gilgit, Dir, Swat, Chitral (N.W.Himalayas) and in Waziristan, Tirah, Kurram agency, and Zhob (Suleman Range). It grows between 1800 and 300 m asl in dry temperate regions and thrives on all geological formations. It is sometimes found associated with *Cedrus deodara*, or with *Quercus ilex* and *Fraxinus xanthoxyloides* or with *Pinus wallichiana*.

Chalghoza seed-crop is an important matter from an economic point of view, and hence trees with broad spreading crowns, even if gnarled and stunted are of more value than well-shaped trees with narrow crowns (Troup, 1921).

Seeds required for edible purposes are obtained from cones which are still green. The cones are collected from the trees, spread in the open and dried in the sun to cause them to open after which the seeds are picked out. Much damage is done to the trees during the collection of the cones; men climb up the trees and by means of a long pole with a hook at the end they wrench off the cones, breaking pieces of branches and damaging the trees. This combined with uncontrolled grazing results in very sporadic natural regeneration (Said, 1959, Troup, 1921).

Due to the steady increase in demand of chalghoza nut in the dry fruit trade for local consumption and export during the last decade, its price has gone up from Rs.300/- (US\$ 5) per kg to Rs.1000/- (US\$ 16) per kg. This has resulted in tremendous amount of pressure on chalghoza forests.

Since, chalghoza pine is an important forest cash crop and its natural regeneration is very poor and scanty, its genetic improvement for better yield and quality of nut (seed) has been initiated under the Forestry Sector Research and Development Project of the Pakistan Forest Institute.

Pinus gerardiana is very sparsely studied. Chandra and Mahindra (1976) reported the results of air layering. The artificial regeneration of Chalghoza pine has been reported by Singh *et al.* (1973). Singh (1990) studied its clonal propagation and effects of different factors on the success of tender short cleft grafting respectively. However, not much work has been done on the genetic improvement of this species except studying the phenotypic variations of chalghoza.

¹ Senior Research Officer/Forest Geneticist, Pakistan Forest Institute, Peshawar

In order to bring chalthoza pine under clonal propagation at par with other fruit crops, efforts were made to graft scion wood of this species on root stock of chir pine, which is native to Pakistan, Bhutan, Nepal, India and Afghanistan. In Pakistan, it is found in the Himalayas specifically in Azad Kashmir, Murree, Hazara, Swat, Dir, Bajawar, Khyber, Malakand and Orakzai districts and agencies. It is easily cultivated in the northern areas of the Punjab and the NWFP. Large plantations of the species have been raised in Mansehra, Abbottabad and Balakot areas of NWFP (Sheikh, 1993).

Materials and Methods

Chalthoza pine scion wood was cleft-grafted on chir pine root stock in Sheringal forest nursery of Dir – Kohistan Project on March 12, 2006. The study involved investigation on the effects of the following factors:

- (i) Compatibility of chalthoza pine and chir pine in grafting.
- (ii) Age of clone (chalthoza trees): One year old scion wood was collected from three chalthoza pine trees of different age groups measuring 20 m, 15 m and 10 m in height.
- (iii) Age of root stock (chir pine): One year and two years old chir pine seedlings raised in poly bags attaining height of 15 – 20 cm and 40 – 50 cm respectively were used as root-stock for cleft grafting of chalthoza pine scion wood.

Two years old branches, bearing secondary branchlets of the last year were collected from the selected trees of chalthoza pine in Gurlai guzara forest (Dir) and brought to the Sheringal forest nursery on 10.3.2006. These branches were kept in moist gunny bags in shade. 10 – 15 cm long tender tip shoots were cut from these branches for cleft grafting on one and two years old chir pine root-stock on 12.3.2006. Equal length cuts were made by exposing cambium in both the chalthoza pine scion shoot and the chir pine root stock. The scions were fitted into the clefts of the root stocks and immediately tied with polythene strips to avoid moisture losses.

The grafted plants were kept in the mistless poly-tunnel system of approximately 70 – 80% humidity. Two separate experiments were laid out for cleft grafting chalthoza pine on one year old and two years old chir pine root stock, in completely randomized block design with single plant plots replicated 15 times.

Results and Discussion

The data on grafting success were recorded 109 days after grafting on June 29, 2006 and the results of surviving grafts are presented in table 1, 2 and 3. Some of these surviving grafts have also initiated shoot growth. The most important finding that has emerged from the trials is the success of cleft grafting of chalthoza pine scion wood on chir pine root stock. It is now possible to grow chalthoza – chir grafted trees in chir pine zone and in areas where chir pine can be planted artificially. This will help enhance chalthoza nut production in the country, bringing down the price from Rs.800/kg to Rs.200 – 300/kg and resulting in increased foreign exchange earnings through export of nuts in the immediate future.

Other important findings of the studies include: (i) Scion-wood collected from medium sized chalghoza tree resulted significantly better in grafting success on chir pine root stock. (ii) Two years old chir pine root stock proved comparatively better than one year old root stock of the species in intra-generic grafting of the two species.

Since the selection criteria of trait is nut and not the timber, therefore medium sized, good cone bearer trees of chalghoza pine should be selected for the collection of scion-wood for grafting on two years old chir pine root stock.

Table 1. Success of chalghoza pine grafting on chir pine root stock (109 days after grafting)

Root stock	Chalghoza Pine Scion-wood collected from		
	Mature tree (20 m Height)	Medium sized tree (15 m Height)	Pole size tree (8 m Height)
	Grafting Success in %age		
1 year old Chir pine seedlings	13	80	7
2 years old Chir pine seedlings	53	80	40

Table 2. Analysis of variance for grafting experiment on one year old Chir pine root stock

S.V.	df	ss	MS	F
Treatments	2	4.933	2.466	20.78**
Error	42	5.067	0.121	
Total	44			

** Differences in grafting treatments are significant at 0.01 probability level

Table 3. Analysis of variance for grafting experiment on two years old Chir pine root stock

S.V.	df	ss	MS	F
Treatments	2	2.41	1.205	5.91**
Error	42	8.57	0.204	
Total	44			

** Differences in grafting treatments are significant at 0.01 probability level

Conclusions

Inter species grafting of chalghoza pine scion wood on chir pine root stock proved successful in two separate experiments. Medium sized chalghoza trees (height 15 m) and two years old chir pine root stock produced significantly better grafting results.

Acknowledgment

The author appreciates and acknowledges the financial support provided by the FSR&D Project of the Ministry of Environment, Government of Pakistan, Islamabad.

being implemented at Pakistan Forest Institute, Peshawar. The cooperation rendered by the Dir-Kohistan Project, Sheringal particularly by Haji Wajihullah, Forest Ranger through the courtesy of Dr. M.I. Siyal the then CCF/NWFP is also gratefully acknowledged.

References

Chandra, J.P. and J.L. Mahindru, 1976. Air-layering of chalghoza (*Pinus gerardiana* Wall.) Indian Forester, 102(2):85-88.

Said, M., 1959. *Pinus gerardiana* 1959. *Pinus gerardiana* (Chalghoza) in the Zhob district (Quetta/Kalat Circle). PJF.9(2).

Sheikh, M.I., 1993. Trees of Pakistan. Pictorial Printers (Pvt.) Ltd. Islamabad, Pakistan.

Singh, N.B., 1990. Effect of different factors on the successf of tender short cleft grafting in chalghoza pine (*Pinus gerardiana* Wall.). Indian Forester 118(6):425-428.

Singh, R.V., D.C. Khanduri, and K. Lal, 1973. Chalghoza pine regeneration in Himachal Pradesh. Indian Forester. 99(3):126-133.

Troup, R.S., 1921. Silviculture of Indian trees. Oxford, Clarendon Press.