

## SUITABILITY OF *EUCALYPTUS KITSONIANA* FOR PLANTING IN PAKISTAN

K. M. SIDDIQUI, S. REHMAN AND A. HUSSAIN\*

### Abstract

Preliminary results of *Eucalyptus* species trials at three locations in Pakistan have shown that the survival and growth rate of *Eucalyptus kitsoniana* are high as compared to other species of this genus. Large scale planting of this species is recommended in afforestation programmes in the country.

### Introduction

*Eucalyptus* species have attracted the attention of foresters since their first introduction in the areas now comprising Pakistan in 1860 due to their inherent ability to withstand harsh environmental conditions and fast rate of growth. Though, *Eucalyptus camaldulensis* and its various genetic forms are currently being planted on a large scale, still a continuous search is being made to find the most suitable and fastest growing species and seed sources for various ecological conditions in the country (Qadri, 1968; Siddiqui, *et al.*, 1979; Siddiqui and Hussain, 1980). This is obvious because genus *Eucalyptus* has a very large number of species, hybrid and genetic forms growing under a variety of ecological condition in their native Australia and there is considerable scope of selecting for improved growth from amongst them. This paper reports the results of studies carried out in different parts of Pakistan to determine suitability of *Eucalyptus kitsoniana* under irrigated and non-irrigated conditions.

### Material and Methods

Seeds of a number of *Eucalyptus* species and thier different sources were procured from Australia in 1976. The description of these seeds is given in Table 1. Seed of other species was collected from their stands at Peshawar. One-year old plants were raised from this seed in the nursery at Peshawar for planting at three different sites. The details of experimental sites and planting plan are presented below:

	Nowshehra	Daphar	Mirpur Mathelo
1. Latitude	34°12'	32°27'	28°12'
2. Longitude	72°03'	73°02'	69°42'
3. Altitude, m	350	230	50
4. No. of species/seed sources	14	16	15
5. No. of plants/replication	16	24	40
6. Spacing, m	3x3	3x2	2x2
7. Year of planting	1977	1980	1983

\* The authors are working in the Pakistan Forest Institute, Peshawar.

Randomised complete block design was used in all experiments. The number of replications was kept as 4 in all of them. The test plantations at Daphar and Mirpur Mathelo were provided irrigation water at regular intervals during summer season from the time of their establishment. In case of Nowshehra plantation hand watering of plants was done during first year of their planting only. All the three experimental sites lie in dry tropical ecological zones of the country.

Survival and growth data collected after 5, 3 and one year of planting at the sites was analysed statistically for comparison of species and seed sources between and within different sites.

## Results and Discussion

In all, 30 *Eucalyptus* species and seed sources were tested at three sites. Their survival and growth data are presented in Table 2. *Eucalyptus kitsoniana* has exhibited a very high survival and growth rate in all experimental plantings. This species, called "Bog gum," is usually found naturally in moist boggy alpine land in Australia (Blakely, 1955). As shown in Table 1, the seed was supplied from the locality of Foster in the state of Victoria with latitude of 38° 39' and longitude of 146° 11' from a stand growing on sandy soil. Though ecological conditions of the locality of its seed origin are quite different than those of localities of introduction, still the species has done well in the latter. This is due to the fact that *Eucalyptus* species have in general, the inherent capacity and plasticity to adapt to extremely variable environmental conditions and to exhibit good growth rate at the same time. This has already been proven in the case of *E. camaldulensis* in many countries of the world (FAO, 1976).

Only seed sources of Australian origin were planted at Nowshehra. *E. grandis*, *E. rudis* and *E. tereticornis* have also shown high growth rate at this place. On the other hand, *E. camaldulensis*, which was planted in both Nowshehra and Daphar did not show this characteristic. However, differences of growth between species and seed sources were found to be statistically significant at all three sites of experiments, indicating large variation in them as regards adaptability to local conditions. Further, the differences of survival % amongst eucalypts of three studies are much larger than those of growth rate. Some species, e.g. *E. trachyphloia*, has as low survival as 9%. Even within one species of *E. tereticornis*, the range of survival between its four seed sources is 37–74%. Survival is an important characteristic for initial stand establishment in the case of introduced species. Percent survival of *E. kitsoniana* seedlings is satisfactory at all places.

In one of earlier *Eucalyptus* species trial at Peshawar, *E. kitsoniana* was also found to have a very high survival and growth rate and was ranked third amongst 52 species included in the trial (Siddiqui and Hussain, 1980). Planting site at Nowshehra is located at a distance of about 40 km from Peshawar and ecological conditions are identical at both places. This study had recommended that large scale field trials of promising species using a number of their seed sources be conducted in various ecological zones in Pakistan. Because of large genetic diversity in the genus *Eucalyptus*, these detailed studies are needed to determine suitability of different

species and their seed sources. It is commonly observed that a *Eucalyptus* species performs very well at a certain place and it becomes hard to reproduce this performance at the same site unless same seed source is used. The test plantations of this study can serve as seed source of *E. kitsoniana* for afforestation purpose.

### Conclusion

Eucalypt species trials in three different localities in Pakistan have shown that *Eucalyptus kitsoniana* grows faster than other species and seed sources. Its survival rate is also satisfactory. On the basis of result of the present study, additional studies using different seed sources of this species are recommended under various ecological conditions in country. In the mean time, its proven local seed source can be used for afforestation.

### Literature Cited

1. Blakeley, W.F. 1955. A key to Eucalypts. Forest & Timber Bureau, Canberra, Australia.
2. FAO, 1976. *Eucalyptus* for planting. Food and Agri. Org. of U.N. Rome Italy.
3. Qadri, S.M.A. 1965. The selection of Australian species for afforestation in West Pakistan. A rational approach. Department of Agriculture, Government of West Pakistan, Lahore.
4. Siddiqui, K.M., M. Khan and S. Akhtar, 1979. Results of 10-year-old *Eucalyptus camaldulensis*, Dehn. provenance study at Peshawar. Silva. Genetica, 28(1): 24-26.
5. Siddiqui, K.M. and Altaf Hussain, 1980. Comparative growth of 52 *Eucalyptus* species at Peshawar. Pakistan Jour. For. 30(1): 18-30.

Table 1

Details of *Eucalyptus* species and seed sources planted at Nowsheria

S. No.	Species/Source number	Origin	Latitude Longitude	Altitude (m)	Soil
1.	<i>Eucalyptus camaldulensis</i> (10727)	Cohuna, VIC	35 45 144 35	75	Alluvial
2.	<i>E. camaldulensis</i> (10885)	Pt. Lincoln, SA	34 35 135 35	90	Limestone
3.	<i>E. camaldulensis</i> (Local)	Peshawar, NWFP.	34 01 71 34	387	Clayey
4.	<i>E. gomocephala</i> (9877)	Western Australia	33 36 115 28	80	—
5.	<i>E. grandis</i> (9559)	Coffs Harbour, NSW	30 18 135 08	90	Grey loam
6.	<i>E. grandis</i> (10720)	N Woolgoolgan, NSW	29 58 153 11	6	Clay alluvium
7.	<i>E. kitsoniana</i> (11625)	Foster, VIC	38 39 146 11	—	Sandy
8.	<i>E. largiflorens</i> (10426)	Carinda District NSW	30 30 147 42	150	Black alluvium
9.	<i>E. largiflorens</i> (8829)	Yantabulla, NSW	29 40 145 00	180	—
10.	<i>E. rudis</i> (8728)	Yunderup, WA	32 55 115 00	—	—
11.	<i>E. tereticornis</i> (9797)	Bulolo Stn, New Guinea	—	—	—
12.	<i>E. tereticornis</i> (10952)	Cooktown, QLD	15 41 145 10	120	Yellow loamy clay
13.	<i>E. tereticornis</i> (8956)	Bulolo Stn, New Guinea	—	—	—
14.	<i>E. tereticornis</i> (Local)	Mansehra, NWFP	34 20 73 15	1100	Clayey

Table 2  
Mean survival, height and diameter of different species  
and seed sources of Eucalypts at three sites.

Species/seed sources	1. Nowshehra			2. Daphar			3. Mirpur Mathelo			Origin*
	Five-year-old			Three-year-old			One-year-old			
	Survival %	Ht m	Dia cm	Survival %	Ht. m	Dia cm	Survival %	Ht. m	Dia cm	
1. <i>E. alba</i>	—	—	—	80	2.7	2.9	—	—	—	P
2. <i>E. amplifolia</i>	—	—	—	85	2.7	2.9	78	1.1	—	P
3. <i>E. annulata</i>	—	—	—	66	2.5	2.4	—	—	—	P
4. <i>E. camaldulensis</i> (Local)	67	10.5	13.8	52	2.5	2.7	—	—	—	P
5. <i>E. camaldulensis</i> (10727)	44	10.1	12.9	—	—	—	—	—	—	A
6. <i>E. camaldulensis</i> (10885)	74	9.1	14.5	—	—	—	—	—	—	A
7. <i>E. crebra</i>	—	—	—	30	1.7	1.5	61	0.8	—	P
8. <i>E. citriodora</i> (India)	—	—	—	—	—	—	63	0.7	—	I
9. <i>E. citriodora</i> (Pakistan)	—	—	—	—	—	—	70	0.8	—	P
10. <i>E. dealbata</i>	—	—	—	—	—	—	83	0.8	—	P
11. <i>E. fruticetorum</i>	—	—	—	26	1.3	0.8	—	—	—	P
12. <i>E. gomocephala</i> (9877)	57	9.7	13.0	—	—	—	—	—	—	A
13. <i>E. grandis</i> (9599)	47	11.9	15.2	—	—	—	—	—	—	A
14. <i>E. grandis</i> (10720)	57	9.7	12.0	—	—	—	—	—	—	A
15. <i>E. kitsoniana</i> (11625)	76	11.4	16.3	74	2.9	3.1	92	1.3	—	A
16. <i>E. largiflorens</i> (10426)	66	8.0	9.3	40	2.3	2.2	43	0.7	—	A
17. <i>E. largiflorens</i> (8829)	49	6.9	7.9	—	—	—	—	—	—	A
18. <i>E. macarthurii</i>	—	—	—	16	1.6	1.5	—	—	—	P
19. <i>E. microtheca</i>	—	—	—	60	1.9	2.0	85	1.1	—	P
20. <i>E. melanophloia</i>	—	—	—	25	1.3	1.4	76	0.7	—	P
21. <i>E. polycarpa</i>	—	—	—	—	—	—	43	0.6	—	P

Species/seed sources	1. Nowshehra			2. Daphar			3. Mirpur Mathelo			Origin *
	Five-year-old			Three-year-old			One-year-old			
	Survival %	Ht m	Dia cm	Survival %	Ht. m	Dia cm	Survival %	Ht. m	Dia cm	
22. <i>E. populnaea</i>	—	—	—	43	2.0	2.0	88	1.0	—	P
23. <i>E. polyanthlemos</i>	—	—	—	57	1.8	1.8	23	0.5	—	P
24. <i>E. rudis</i> (8728)	80	11.4	14.9	59	2.0	2.3	70	0.9	—	P
25. <i>E. tereticornis</i> (Local)	65	11.4	14.6	42	1.2	1.1	—	—	—	P
26. <i>E. tereticornis</i> (9797)	47	8.6	11.0	—	—	—	—	—	—	A
27. <i>E. tereticornis</i> (10952)	74	11.2	13.8	—	—	—	—	—	—	A
28. <i>E. tereticornis</i> (8956)	37	8.8	12.1	—	—	—	—	—	—	A
29. <i>E. torelliana</i>	—	—	—	41	1.5	1.1	60	0.5	—	P
30. <i>E. trachyphloia</i>	—	—	—	—	—	—	—	0.3	—	P

\* P—Pakistan

A—Australia