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SOME ASPECTS OF THE VEGETATIVE PROPAGATION OF EUCALYPTUS SALIGNA, SMITH
BY GRAFTING

ALGUNOS ASPECTOS DE LA PROPAGACION VEGETATIVA DE EUCALYPTUS SALIGNA, SMITH
POR INJERTO

QUELQUES ASPECTS DE LA PROPAGATION VEGETATIVE DE L'EUCALYPTUS SALIGNA, SMITH
AU MOYEN DE GREFFES

WALTER SUITER FILHO¹ - NELSON BARBOZA LEITE²

¹ Forestry Department, ESALQ-USP,

Piracicaba-SP

² IPEF - Piracicaba-SP

Brazil



Summary

The purpose of this study has been to determine the influence of the clones of *E.saligna* Smith on the success of the grafting, taking into account the behavior of the rootstock and scion as far as survival, growth and incompatibility are concerned. No significant influence was observed between botanical variations of the clones and the success of the grafting, and any relationship among the factors considered. It was observed, however, a significant correlation between survival and rootstock, and between incompatibility.

Resumen

El propósito de este estudio ha sido determinar la influencia de los clones de *E.saligna* Smith en el éxito del injerto, teniendo en cuenta el comportamiento del portainjerto y el vástago en lo que se refiere a la supervivencia, el crecimiento y la incompatibilidad. No se observó ninguna influencia importante de las variaciones botánicas de los clones en el éxito del injerto, ni tampoco entre los factores considerados. Sí pudo observarse, empero, una significativa correlación entre la supervivencia y el portainjerto, y la incompatibilidad.

Résumé

L'objectif de cette étude a été de déterminer l'influence des clones de *E.saligna* Smith sur le succès des greffes, compte tenu de la conduite de la plante greffée et de la greffe du point de vue de la survivance, la croissance et l'incompatibilité. On n'a observé aucune influence significative entre

II - INTRODUCTION

The technological development of wood industries has been requiring a raw material with increasing uniform and well-defined characteristics. In this regard, the scientists engaged in forest improvement have been working to meet these requirements, and also to obtain an economic productivity of the forests.

In Brasil, the Eucalyptus has been intensively used in reforestation programs. The genus Eucalyptus comprises a great number of species, and many of them have been successfully introduced in Brasil. The increasing interest in the culture of eucalyptus has developed an increasing necessity of seeds.

In the introduction, the species were planted collectively, giving chance to a significant crossbreeding, which resulted in the development of hybrids and, consequently, in the variation among the forest stands(13).

Presently, with a better knowledge of genetics of trees and with a better knowledge of the various species and their importance, the studies are being directed toward selection of typical clones, progeny studies, and later instalation of seed orchards, utilizing the vegetative

propagation through the process of grafting of the better clones. These seed orchards, in addition of providing improved seeds of a certain species, are also aimed at obtaining fructification in trees of small stature, controlled pollination studies, and production of artificial hybrids.

The works on grafting, although relatively successful as far as survival of the grafts, are requiring some understanding about the incompatibility between rootstock and scion after they have reached a certain stage of development, which is characterized by the formation of rejection tissues at the grafting region, resulting in the killing of the plant.

III. MATERIAL AND METHODS

III.1. Material

III.1.1. Clones Utilized

Seven clones of E.saligna Smith from the Horto Florestal of Mairinque (N^o 33, 49, 50, 53, 71, 72 and 76), and 2 clones of E.saligna Smith from the Horto Florestal of Rio Claro (N^o 1445 and 1478) were utilized in this study. From these clones, botanical material were collected and submitted to a thorough examination to determine the characteristics of the species. Results were as follows:

Tree N ^o	Local	Age	Height(m)	DBH (cm)	Botanical characteristics
1445	Rio Claro	51	43	118	Type saligna (13)
1478	Rio Claro	51	41	93	" "
33	Mairinque	32	36	67	" "
49	Mairinque	32	36	50	" "
50	Mairinque	32	32	60	" "
53	Mairinque	32	30	76	Typic saligna (13)
71	Mairinque	32	30	53	" "
72	Mairinque	32	32	80	" "
76	Mairinque	32	31	47	" "

III.1.2. Rootstocks

The rootstocks were formed in 1-liter plastic bags, by direct sowing. About 120 seedlings of each clones were produced, and also about 120 seedlings of commercial seeds of E.saligna Smith from Australia.

III.1.3. Scion

The scions were obtained from the same clones which provided the seeds for the rootstocks, except for the E.saligna imported from Australia.

III.1.4 Local

The study was carried out in the nursery of the Forestry Department of the ESALQ-USP, in Piracicaba. The rootstocks came from Faculdade de Ciências Médicas e Biológicas de Botucatu-SP.

III.2. Methods

III.2.1. Experimental Design

The study was planned according to a randomized blocks statistical design, with two replications. Each plot contained 5 grafts. Clones of two different locations were utilized (Mairinque and Rio Claro) and the control was obtained with commercial seeds from Australia. The experiment contained 90 treatments, that is, there were 10 different rootstocks in which different clones were utilized.

III.2.2. Grafting

The grafting was executed in the nursery 5 months after the sowing. The scions were collected the day before the grafting and kept uniformly in refrigerators (11).

The type of grafting utilized was the cleft graft (9). The grafts Figure 1 were protected with plastic bags (15), which were removed 30 days after the grafting. The plastic strips utilized to fix the grafts were removed 60 days after the grafting. The same operator worked throughout the experiment.

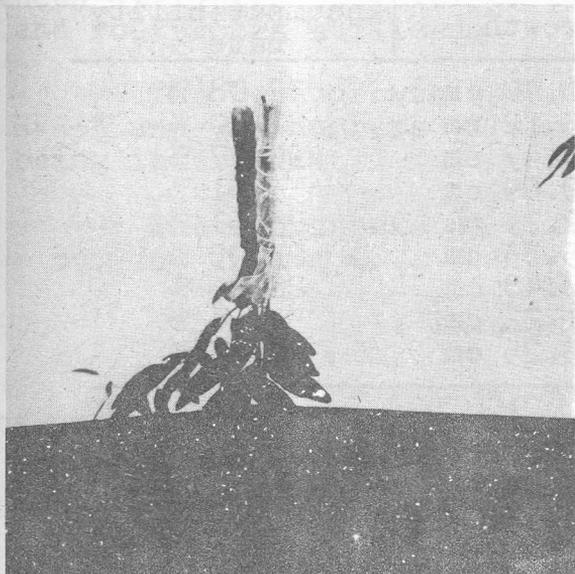


Figure 1. Grafts protected with plastic bags.

III.2.3. Collection of Data

The counting of the survivals was carried out 70 days after the grafting. It was considered as a survivor that which presented initial sign of growth.

The measurement of the development of the plant was accomplished with a measuring stick, and it was executed 150 days after the grafting. At the same time, the diameters of the rootstocks, scions, and the grafting region were measured. The diameter of the rootstock and of the scion was measured 5 cm from the grafting region.

IV. RESULTS

Table I: Average survival, growth and incompatibility rate of the rootstocks.

Clones	Survival	Growth	Incompatibility rate
R. 71	4.12	73.58 cm	25.78 %
R. 49	4.37	79.44 cm	25.31 %
R. 50	4.23	82.04 cm	26.63 %
R. 72	4.10	89.72 cm	29.79 %
R. 53	3.83	79.97 cm	26.86 %
R. 33	3.88	94.50 cm	28.84 %
R. 76	3.84	88.31 cm	25.83 %
R. 1478	3.57	78.43 cm	26.95 %
R. 1445	3.60	78.32 cm	26.83 %
R. 60	4.32	88.90 cm	24.68 %

Table II: Average survival, growth and incompatibility rate of the scions.

Clones	Survival	Growth	Incompatibility rate
S. 71	4.05	68.40 cm	32.08 %
S. 49	3.93	83.82 cm	22.20 %
S. 50	3.72	75.47 cm	28.27 %
S. 72	3.99	79.69 cm	33.51 %
S. 53	4.09	82.24 cm	23.51 %
S. 33	4.05	105.33 cm	23.95 %
S. 76	4.35	98.48 cm	22.25 %
S. 1478	4.14	71.22 cm	32.54 %
S. 1445	3.56	85.25 cm	22.43 %

Table III: Analysis of Variance of Survival, Growth and Incompatibility rates.

Sources of Variation	Survival		Growth		Incompatibility Rate	
	D.F.	S.S.	D.F.	S.S.	D.F.	S.S.
Scions	8	2.15	8	23,263.77	8	3,758.06
Rootstocks	9	3.34	9	7,090.05	9	393.35
Interaction(SxR)	72	7.11	72	22,420.28	72	4,542.30
Treatments	(89)	(12.60)	(89)	(52,774.10)	(89)	(8,693.71)
Blocks	1	0.08	1	396.49	1	5.26
Error	89	14.06	89	19,111.78	89	2,107.79
Total	179	26.74	179	72,282.37	179	10,806.76

V. DISCUSSION OF THE RESULTS

V.1. Survival

There has not been any influence which could be significantly attributed to the scions of the different clones. As to the rootstocks, however, the analysis showed significance at 5 percent level of probability.

Better results were found with the rootstocks No 60, 50 and 49, followed by No 76, and 72. Those numbered 1445, 1478, 76, 33 and 53 were the worst.

V.2. Growth

The initial growth of the grafts showed significant differences at 1 percent level of probability, for the different scions and rootstocks utilized.

The best growth was observed in the grafts from the clones No 33 and 76. Numbers 71 and 1478 were the worst, the others being intermediate.

The rootstocks on which the best growth was observed were: No 33, 76, 72 and 60.

V.3. Incompatibility (Figure 2)

There was a significant difference at 1 percent level of probability which can be ascribed to the scion. Clones No 76, 1445 and 49 showed the least incompatibility rates.



Figure 2. A graft showing incompatibility.

The interaction (SxR) showed significance at the 1% level of probability. Better combinations were as follows:
R₃₃ x S₁₄₄₅, R₇₆ x S₄₉, R₄₉ x S₄₉, R₇₆ x S₅₃, R₇₂ x S₄₉,
R₆₀ x S₁₄₄₅.

VI. CONCLUSIONS

VI.1. The different behavior of the rootstocks and scions of the clones studied did not present any correlation with the typical clones in relation to survival, growth, and incompatibility.

VI.2. Due to the absence of correlation between the factors considered (survival, growth, and incompatibility) studies of these factors should be done independently.

VI.3. The survival being dependent on the rootstock, future research should be aimed at determining the ideal characteristics of the rootstocks.

VI.4. The incompatibility being a function of the scion, many future researchs can be developed.

VI.5. The works toward selection which keep a certain pattern for the species, do not prevent the process of grafting these clones.

VI.6. Due to the increasing demand of seeds, and taking into account the lack of better information about the problem of incompatibility, which is being a limiting factor of the grafting of E.saligna Smith in our region, it is suggested that the seed orchards be installed with a great number of clones, thus permitting the elimination of those with higher incompatibility rates, until the real causes of such behavior are determined.

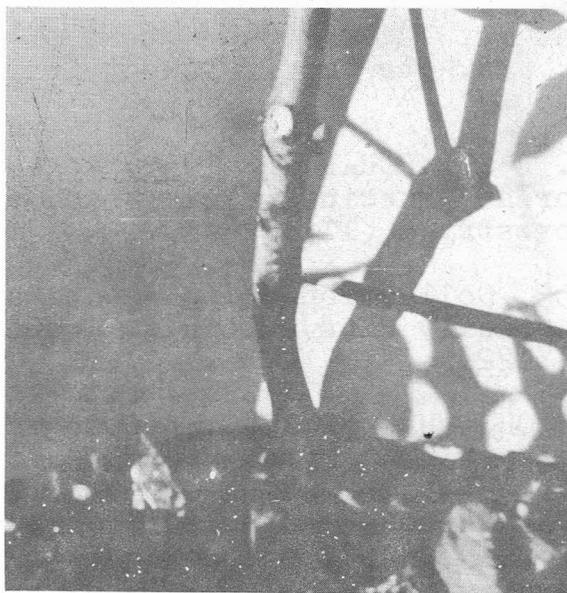


Figure 3. A successful graft.

VII. LITERATURE CITED

1. AHLGREN, C.E. 1962. Some factors influencing survival, growth and flowering of intraspecific and interspecific pine grafts. *Journal of Forestry* 60 (11):785-89.
2. BRAUN, H.J. 1962. Water economy and water supply of the scion in the tree grafts. *Zeitschrift für Botanik*, Stuttgart 50:389-404.
3. COOLING, E.N. 1967. Improvement of seed of Exotic Forest trees for use in Zambia. *FAO World Symposium on Man-Made Forests and their industrial importance*. Canberra-Australia. Documents 3:1846-1856.

4. DORMLING, I. 1964. Algunos metodos de injertado. Unasyuva 18(2-3): 130-131.
5. ESTAÇÃO EXPERIMENTAL DO ESTADO DE LAKE, 1956. Increasing sucess in grafting. Report Lake Sta.For.Exp.Sta. 1956|1957|:39-40.
6. GURGEL FILHO, O.A. 1959. A propagação vegetativa de espécies florestais. Revista da Agricultura 34(1):11-30.
7. MERGEN, F. and H. ROSSOLL. 1954. How to root and graft Slash Pine. Sta.Pap.Steast. For.Exp.Sta.No 46 22p.
8. MIROV, N.T. 1940. Tested methods of grafting pines. Journal of Forestry 38:763-77.
9. MOWAT, E.L. and R.R. SILEN. 1957. A test of grafting Ponderosa Pine. Res.Note Pacif.Nthwest For.Range Exp.Sta. No 155. 5p.
10. NIENSTAEDT, H. E COLABORADORES 1958. Vegetative propagation in forest genetics research and pratice. Journal of Forestry 56(11):826-39.
11. PERRY, T.O. 1955. Collection Shipping and storage of slash and Loblolly Pine cuttings. Journal of Forestry 55(2):122.
12. PERRY, T.O. and CHI-WU-WANG 1960. Pruning of Slash and Loblolly Pine grafts 58(4):323.
13. PRYOR, L.D. 1971. Aspectos da cultura do eucalipto no Brasil. IPET 2/3:53-59.
14. REPORT LAKE ST. FOR. EXP. STA. 1956. Increasing sucess in grafting. |1957|:39-40.
15. ROMBERG, L.D. 1956. Use of polyethylene bags for covering bark grafts. Report Northean Nut. Growers Association. New Haven Conn. 47:71-3.
16. STEFANSSON, E. 1952. |Grafting conifers in the open| Svenska skogsv Fören Tidskr 50(2):194-220.
17. SUITER FILHO, W. e H.A. MELLO 1967. Nota preliminar sôbre enxertia em Pinus. O Solo LIX(2):31-36.