# Competition and Root Systems Coalescence in Nest Seeding of some Forest Tree Species with a Special Account of Beech Treatment

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Root system coalescence under natural conditions of an environment has already been described in literature. This phenomena, however, had nothing special in itself to attract any particular attention or interest until some very remarkable results were achieved in the practive of afforestation, and the manifestation of competition was noticed.

The method of net seeding is such a method which consists of taking a definite number of germinate seeds and sowing them according to a previously made plan, and at set distances. It means that in every net quite a number of seeds has to be put together, an experimental plot may be made, too, with greater or smaller density of seeding. Plants growing in such clusters differ from one another, having unlike vitality as well as different rate of growth, and coming into contact among themselves. After three or four years coalescence of root systems occurs, and the dense overground canopy is formed. Those plants growing in such.a dense canopy which are not strong enough to survive are forced to retreat or they are supressed while others that are more vital grow better and much faster. However, it has been observed that the root systems of suppressed plants still survive, growing together with other roots, and continue to supply with food overground plants that are left over. Thus such a well developed and branched out system made of coalescence of a great number of plants is capable to nourish much better those plants that have survived which are now showing a higher rate of growth than control plants. It is also observed, owing to the use of radio isotopes, that sap contributes to supply the plant with ingredients only when coalesced roots of some species are in question.

After these facts were noticed a ronsiderable number of scientific reports has been published in periodicals dedicated to Biology and Agriculture. The work on this problem has aroused a great interest among the research workers who try to develop it further and improve this method of seeding having in mind its application in practice. At the same time some theoretical interpretations were brought forward dealing with the question of competition among individual plants as well as plants of various species. This problem was studied in some countries and especially treated in publications of the Soviet Union were this seeding method as a very practical one was applied for afforesting of vast steppes in which the erosion of fast blowing dry winds create very unfavourable conditions not only for crops but also for every type of vegetation. It has been proved by experiments that in these areas plants sowed individualy by strip seeding or broadcast seeding are very hard to maintain. As it was beforehand mentioned only by nest seeding a strong cluster of coalesced root systems may be created which is able to survive in competition with herbs and weeds. This method of seeding has many advantages over others for building shelter belts on dry steppes as it contributes to the formation of dense canopies of trees' crowns where there are sharp changes in microclimatic conditions humidity conservation, and making up of favourable conditions for agricultural crops.

At the Faculty of Forestry in Belgrade, at the Institute for Plant Selection, a number of experiments were undertaken with several species of trees such as, for instance, Pensylvanian Ash tree, Sumach, Eeech tree, and some autochthone coniferous trees. During several years of observations of every particular species, and by using the comparative method, one has come up to very interesting results. Root coalescence of Sumach was already been noticed in the first year, which represents an entirely new phenomena even in literature for this manifestation was usually recorded in the third year, as for instance, beech root coalescence, or in the fourth year ash root coalescence.

## Working Method *and Research* Results

Beech seeds and seeds of other above mentioned species were sowed in nests at a distance of 50 cm. Three plots were separated for each species, and on every particular plot a set number of seeds were sowed, 19, 20 or 30 seeds. Each plot had 38 nests per 10 square meters, and all seeds belonged to the same tree. Simultaneously, the method of strip seeding and broadcast seeding was applied for control.

Different number of seeds — 10, 20 or 30 — on individual plots was taken in order to verify what is the influence of density of seeding and in order to find out, in comparison with the control plants, what is the height growth in cm.

Beech root coalescence was observed after three years on plot with 20 seeds (and on two samples only). Ash root coalescence was noticed after four years, and Sumach root coalescence after the first year and on the plot sowed with greatest number of seeds. Control plants showed no root coalescence.

From the annexed pictures one may see the right place and character of root coalescence. Most frequently the root coalescence was observed in the root collar, see Figure *1* (Beech tree); Figure 2 (Sumach); Figure 3 (Pennsylvanian Ash tree).

Overground parts of plants may be differentiated from weaker to stronger trees which can easily and clearly be seen on a sample of Sumach, represented in Figure 5.

Figure 5 demonstrates that a plant with a retarded growth of root systems has stunted averground parts, too.

In Figure 6 the crosscut of Sumach coalesced root is clearly visible, i. e. secondary wood, cambium zone, elements of primary and secondary bark, and the beginning of colescence.

The greates average height of growth was recorded on a plot with 20 seeds, and it was somewhat less than one plot with 10 seeds, but the smallest was on plot with 30 seeds. It was evident that strip seeding and broadcast seeding did not give the same results.

## Discussion *and Conclusions*

As it has been noted beforehand the phenomena of coalescence root systems in nature is a frequent one, but when

*Fig. 1.* — **Moesian Beech.**

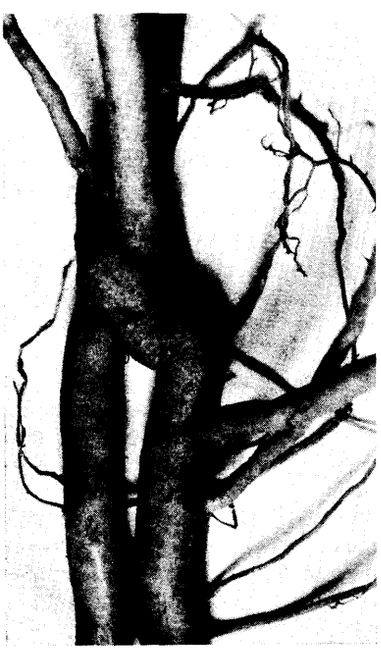

*Fig. 2.* — **Sumach tree.**

the method of group seeding is applied i. e. nest seeding on a set plan with quite a number of germinated seeds of the same species, one gets a whole bunch of grafted roots. Overground parts are little by little reduced, and only the most vital and the strongest plants survive which retain the greatest capacity of absorbing nutrients from the soil. The functional ability of root systems stays unimpaired, reduced as well as unreduced, that in such a coalesced form more sufficiently supply plants with nourishing ingredients, and that endure better in competition with herbs and weeds under unfavourable climatic conditions.

Beech belongs to the mesophyll species which needs optimal humidity or successul growth and development. Beech afforestation is rather rarely carried up nowadays. However, in this experiment the important role is given to the beech, and according to our preliminary observations the indications which were obtained prove that a typical mesophyll species may be grown with much better results on an open field if nest seeding is applied. In the practice of afforestation beech tree was usually left to be reproduced naturally where the conditions are most suitable for it. By application of the above described method, beech may be also taken into consideration for that purpose.

Root coalescence most frequently occurs in cases with 30 or 20 seeds, which means that the greater density of sowing gives more possibility for roots to get into contact and for their coalescence. Beech root coalescence was observed in the third year. As for the overground differentiation and mutual competition about nutrients one must take into account the quality and vitality of individual seeds, too. On control samples one may often observe that the root system of the reduced plant usually is coalesced with root system of the neighbouring plant, which is much

*Fig.* 3. — **Pennsylvanian Ash.**

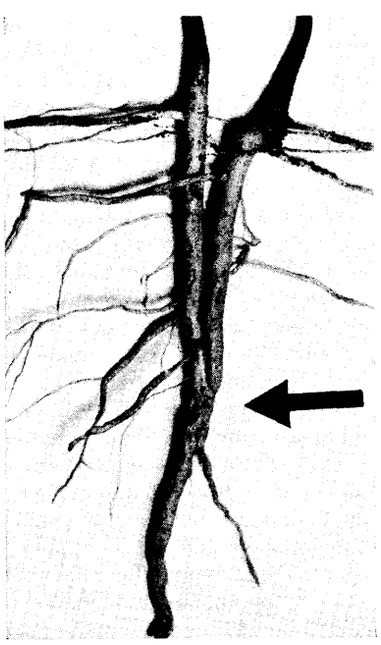

*Fig. 4.* — **Sumach tree.**

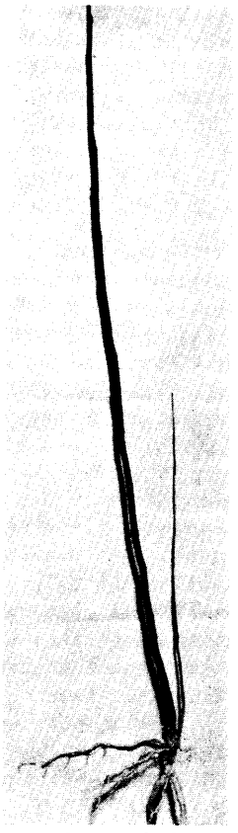

Fig. 5. — Overground part of plants (Sumach tree).

stronger, supplying it with nutrious ingredients and receiving from it necessary assimilates. This fact is proved, according to available literature by the method of radioisotopes.

Summarizing the above quoted observations one may say that the application of the group seeding method quite a number efficient and useful things are obtained in the practice of afforestation as well as from the purely biological standpoint of view many interesting various relations of competition among species.

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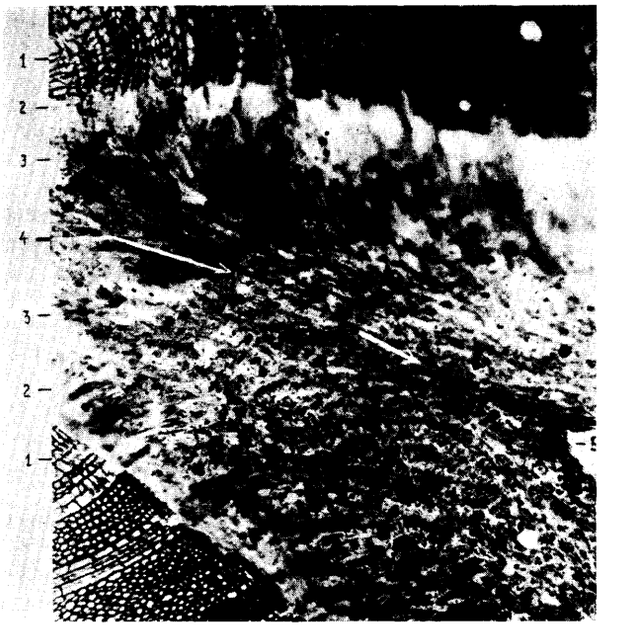


*Fig.* 6. — Cross section of coalesced roots. — 1. Secondary tree. — 2. Camibum zone. — 3. Elements of primary and secondary bark. — 4. Zone of coalescence. — 5. Beginning of the coalescence.

# Initiation and Development of Graft Incompatibility Symptoms in Douglas-fir[1])


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## Introduction

Incompatibility problems have plagued grafters for centuries. Most past reports of grafting difficulty came from the pomology literature, but grafting incompatibility has now become a serious problem to some workers in forest genetics. In the late 1950's, grafted clonal seed orchards were started for Douglas-fir *(Pseudotsuga menziesii* (MIRB.) FRANCO) on the west coast of North America. Some graft incompatibility first became evident 12 months following grafting. A survey of 3,059 grafts (4 to 8 years old) from three seed orchards in Oregon and Washington revealed that only 54% were alive in 1966 and more seemed destined to die. The grafting problem has become so severe that the practicality of establishing future grafted Douglas-fir seed orchards has been seriously debated.

Graft incompatibility has been reported in many species of fruit and forest trees. The general subject was reviewed

[1]) This paper summarizes one section of the author's Ph. D. thesis which was submitted to the University of Idaho in 1967.