

An experiment on the invasion of mycorrhizal fungi into prairie soil.

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Several experiments indicate that the mycorrhizal fungi of forest trees are lacking in the prairie soils of the Central United States (e.g. Hatch 1936, White 1941, McComb 1943). Afforestations failed when seedlings, sown in prairie soil, died in their first or second growing season. On the other hand, when mycorrhizal seedlings were planted in prairie soil they grew quite well. Further, growing tree seedlings in prairie soil nurseries has encountered no difficulties if the soil has been inoculated with forest humus containing mycorrhizal fungi. The lack of adequate mycorrhizal fungi is probably a principal reason why the advance of forests into the prairies has been extremely slow although the climate is not unfavourable to forest vegetation (Wilde, Wilson & White 1949).

During the last decades, by planting a few rows of trees so-called shelterbelts have been established in prairies, to pro-

tect cultivated lands from drying winds. Where mycorrhizal seedlings have been used for shelterbelts they have grown very well on the whole. The following experiment was arranged to study the extent of mycorrhizal fungi spread from such shelterbelt into prairie soil.

Sandy prairie soil from Plainfield Prairie, Waushara County, Wisconsin, was used for the experiment. On this prairie two shelterbelts were selected, 1) a *Pinus resinosa* plantation running E-W, and 2) a *Pinus silvestris* plantation running N-S. The age of both was 15 years and the height of trees about 5 metres. Soil samples were taken at various distances from the outermost tree row of the shelterbelts, north of the first (Series I) and west of the latter (Series II). The experiment was carried out at the Soils Department of the University of Wisconsin in 1950—51.

Each soil sample was divided into two clay pots and seeded with *Pinus strobus*

Table 1. Occurrence of mycorrhizae in pine seedlings grown in prairie soil.

Distance of sample from trees, metres	Series I				Series II			
	4 months after seeding		5 months after seeding		4 months after seeding		5 months after seeding	
	<i>P. banksiana</i>	<i>P. strobus</i>	<i>P. banksiana</i>	<i>P. strobus</i>	<i>P. banksiana</i>	<i>P. strobus</i>	<i>P. banksiana</i>	<i>P. strobus</i>
0.5	++	—	++	++	++	+	++	++
1.5	+	—	—	—	++	++	++	++
2.5	—	—	—	—	+	—	++	+
4.5	—	—	+	—	+	—	++	++
6.5	—	—	—	—	++	—	++	+
8.5	—	—	—	—	—	—	—	—
12.5	—	—	—	—	—	—	—	—
16.5	—	—	—	—	—	—	—	—

++ Numerous well developed mycorrhizae
 + Few mycorrhizae or young ones, identified microscopically
 — No mycorrhizae

and *P. banksiana*. The one pot was examined after 4 and the other after 5 months (the experiment was conducted in winter time in a cool greenhouse; hence the seedlings developed very slowly). Dichotomously branched pine mycorrhizae were easily detected in most cases with the naked eye. In doubtful cases short roots were examined microscopically, when even very young stages of mycorrhizal infection could be discovered (Mikola & Persidsky 1951).

The results are presented in Table 1. In *P. banksiana* seedlings, which grew faster, mycorrhizae developed a little sooner than in *P. strobus*. The roots of *P. silvestris* had spread further than those of *P. resinosa*, which had grown more slowly.

The size of mycorrhizal and nonmycorrhizal seedlings showed no statistically significant difference. The biggest seedlings, however, were mycorrhizal.

This experiment confirms the experience mentioned before, that mycorrhizal fungi are lacking in the native prairie. On the other hand, there are evidently no harmful factors preventing the growth of these fungi, for when introduced with seedlings to prairie soil they thrive as well as in forest soil. They grow only in the closest proximity to roots and advance no further from trees than the roots; mycorrhizae of shelterbelt trees were found in many of those soil samples where mycorrhizae developed in the seedlings.

References:

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