

REINTRODUCTION OF FOUR *QUERCUS* SPECIES INTO A SEMIDESERT AREA IN MEXICO

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INTRODUCTION

The response of germinated acorns of four endemic *Quercus* species upon reintroduction into their natural habitat in Valsequillo Valley, Puebla, México, was evaluated.

Besides this response, the emergence, growth and survival of seedlings of two species of white oaks: *Q. microphylla* (Fig. 1) and *Q. glaucoides* (Fig. 2) and two species of red oaks: *Q. acutifolia* (Fig. 3) and *Q. mexicana* (Fig. 4) under contrasting planting conditions were also evaluated. The contrasting conditions were: water stress and light levels with and without predator exclusion.

METHODOLOGY

Study area

The study was carried out in Valsequillo Valley, Puebla State, Mexico, located at 18° 56' 10" N, 98° 07' 55" W, and an elevation of 2100 m. The climate is temperate humid, with an annual temperature of 16.7°C and 776 mm of mean annual rainfall.

Vegetation

Vegetation in the area consists mainly of oak woodlands (*Quercus* spp.), xerophytic shrublands with *Rhus standleyi*, *R. trilobata*, *Ceanothus coeruleus*, *Arctostaphylos pungens* and *Amelanchier denticulata*, and induced grasslands. Large areas are devoid of vegetation.

Acorn collection

Acorns from the 4 species were collected between July and November. They were separated from cups, floated in water and the damaged acorns were discarded.

Acorn planting

Nine hundred acorns of each species were chosen randomly. They were sown (50 acorns per tray) in vermiculite, placed in a greenhouse, and watered every other day. Upon germination, acorns were transplanted between August and November into the field sites with different microclimatic conditions: 1) Open site (full sun), 2) Shaded open site, and 3) Woodland site. Data was recorded monthly for 22 months.

RESULTS

Germination

The red oaks showed a delayed radicle appearance followed by slow shoot emergence, while the white oaks showed a very fast radicle appearance. Shoot emergence in the field sites occurred over a 2-6 month period in the case of red oaks, but over 12-14 months for the white oaks. These differences in germination and seedling emergence give an advantage in root growth to the white oaks, because their acorns fall during the rainy season.

Emergence

In general, seedling emergence was lower than 50% with the exception of the red oak *Q. mexicana* at the shaded open site. There is a slight trend for a higher percentage emergence on the control than on the exclusion plots. Emergence is affected by factors such as soil temperature and desiccation of the radicle. For all species, emergence was highest at the shaded open site, intermediate at the open site, and lowest at the woodland site.

Survival

There were differences in seedling survival and growth for all the species studied. At the open shaded site all the species showed similar survival (40-82%), which suggests that the conditions created here were suitable for the establishment of seedlings. At the full exposure site, white oaks showed much better survival than the red oaks. Only 15% of the *Q. acutifolia* seedlings survived to the end of the experiment.

CONCLUSIONS

From the four *Quercus* species studied, the white oaks showed greater survival 22 months after planting. However, the red oaks, in particular *Q. mexicana*, established quickly and grew faster in the first months after planting. The different germination patterns, earlier root development in white oaks, earlier shoot development in red oaks, explain the different biomass allocation patterns and support the hypothesis that white oaks are better adapted to dry areas. The length and thickness of the root in white oaks play a very important role in long-term survival.

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Fig 1. *Q. microphylla* in Valsequillo, Puebla, Mexico



Fig 2. *Quercus glaucooides* growing in El Aquacate, Puebla.



Fig 3. *Quercus acutifolia* growing in Valsequillo, Puebla.



Fig 4. *Q. mexicana* in Valsequillo, Puebla, Mexico

all photos by author