“The role of vegetation in the redistribution of infiltration in a semiarid zone”

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Arid and semi-arid regions cover approximately 48% of the national territory in Mexico.

The predominant species in this area are mostly made up of huizache (Acacia Farnesiana) and mesquite (Prosopis Laevigata).

The importance of the Huizache’s tree in the redistribution of the infiltration as well as their value in the semi-arid ecosystems of Querétaro is unknown.
1. Is the infiltration process affected due to the presence of huizaches tree?

2. Is the initial humidity the cause of the redistribution of the infiltration?
The initial (and final) decline in moisture from the trunk outward may depend on a combination of 3 factors: bioturbation, slope and soil moisture gradient because in non-wooded areas the sun and wind are likely to dry out the surface of the ground around the trees, producing a displacement of bound and free water in all directions with a more pronounced effect to the south and may be the predominant wind direction.
Lyford(1969) developed a diagram in which he separated 3 zones around the tree: near, intermediate and far. He performed 1 random infiltration test in each of the zones in 4 quadrants. He found that the infiltration decreased as it moved away from the trunk of the trees.

Figure 2. Diagram shows location of sampling points. Lyford(1969)
Experimental site description

Semi-arid zone
Mean annual temperature of 17°C
Mean elevation 1968 msnm
Average annual precipitation 503 mm
Rainy season from May to October
Plot area of 0.19 km²

The infiltration tests were carried out having between 1-4 days of rain prior to the test for trees 1 and 2. For tree 3 there were occasional rains since it was not the rainy season.

Huizache’s tree description

<table>
<thead>
<tr>
<th>Variable</th>
<th>Tree 1</th>
<th>Tree 2</th>
<th>Tree 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>3.43m</td>
<td>3.68m</td>
<td>3.30m</td>
</tr>
<tr>
<td>Crown ratio</td>
<td>4.25m</td>
<td>4.10m</td>
<td>3.92m</td>
</tr>
<tr>
<td>Trunk diameter</td>
<td>0.45m</td>
<td>0.38m</td>
<td>0.40m</td>
</tr>
</tbody>
</table>
Location of infiltration tests

Hyphotesis
Without partitition

Co–arranged Hyphotesis
with partition

Tree Crown
METHODOLOGY

Infiltration test through single ring

Particle size analysis and texture of soils

4.9 liters approx.
RESULTS

Soil texture

Figura 3. Soil triangle texture for 12 sampling points
Initial Water Content (IWC) and Final Water Content (FWC): Tree 1

Initial Water Content (IWC) and Final Water Content (FWC): tree 2

Spring- 2018

Winter 2019
Cumulative infiltration in 4 axes: tree 1
Infiltration redistribution: tree 1

Tree Crown radius

Infiltration rate mm h\(^{-1}\)

Relative distance to the trunk in radio of the tree crown

- NORTH
- WEST
- SOUTH
- EAST
Infiltration redistribution: tree 2

Tree Crown radius

Relative distance to the trunk in radius of the tree crown

- NORTH
- WEST
- SOUTH
- EAST
Infiltration redistribution: tree 3

Tree Crown radius

Relative distance to the trunk in radio of the tree crown

- NORTH
- WEST
- SOUTH
- EAST
- NORTHWEST
- SOUTHWEST
- SOUTHEAST
- NORTHEAST
It is consistent in the 3 individuals that infiltration grows remarkably in the area delimited by r/2 and r of the tree crown, from the tree trunk, in the 4 axes analyzed.

Sampling points with higher initial humidity have a greater infiltration, but respecting the observed bell shape.

The previous results suggest that the predominant species in the central plateau desert in Mexico play an important role in the redistribution of infiltration.

We recommend carrying out tests on other native species in the area in order to generalize the behavior of the infiltration.

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