# ヒヨコマメの乾燥および塩ストレス応答関数の測定
# Determination of Drought and Salinity Stress Response Function for Chickpea

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## Introduction

Chickpea (Cicer arietinum) is one of major legume crop widely cultivated in dry areas. To determine the tolerance of the crop to drought and salinity stresses in terms of parameter values of the stress response function (SRF), we conducted a pot experiments in a greenhouse. The SRF (additive form) is defined as

$$\alpha = \frac{1}{1+\left(\frac{h}{h_{50}}+\frac{h_o}{h_{o50}}\right)^p}$$

where $h$ and $h_o$ are matric and osmotic potential, respectively, and $h_{50}$, $h_{o50}$ and p are plant specific fitting parameters.

## Materials and methods

Nine 1/5000a Wagner pots were used for three treatments: drought-stressed (W), salinity-stressed (S), and control pots for estimating relative transpiration. Daily transpiration rates were observed by weighing pots, and the soil surface of each pot was covered. Masa loamy sand was packed into the drought stress pots while Tottori sand was packed into others. Soil water contents were measured hourly using two soil moisture probes (10HS) for drought pots, and two probes (TEROS12) for both soil water content and bulk electrical conductivity were monitored for salinity pots. When the ratio of actual to potential transpiration reached below 20%, root length distributions were obtained by dismantling the pots. The parameter values for both drought and salinity functions were estimated using inverse analysis.

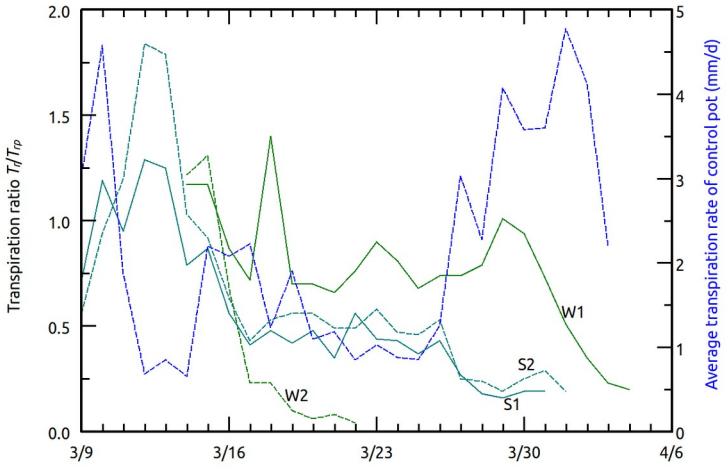


Figure 1. Time evolution of transpiration ratio

## Results and Discussion

Time evolution of transpiration ratio , soil moisture for salinity stress pots, electrical conductivity of soil solution are shown in Figure 1, 2, and 3, respectively. Root distributions are drawn in Figure 4. Inversely determined stress response functions are drawn in Figure 5. There was large difference between $h_{50}$ and $h_{o50}$. Chickpea found to be moderately sensitive to drought stress while moderately tolerant for salinity stress.

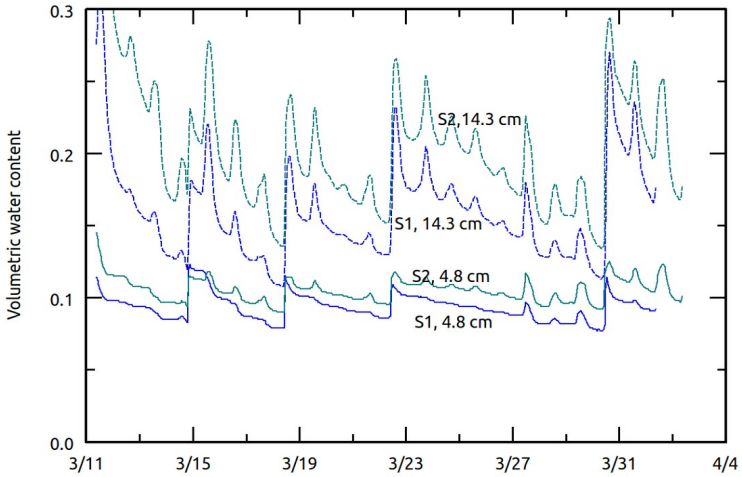


Figure 2 Time evolution of soil moisture for salinity stress pots.

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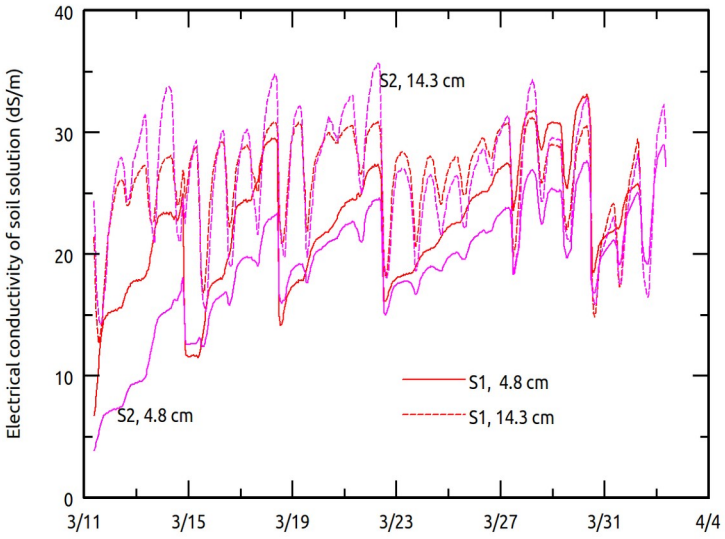


Figure 3 Time evolution of EC of soil solution.

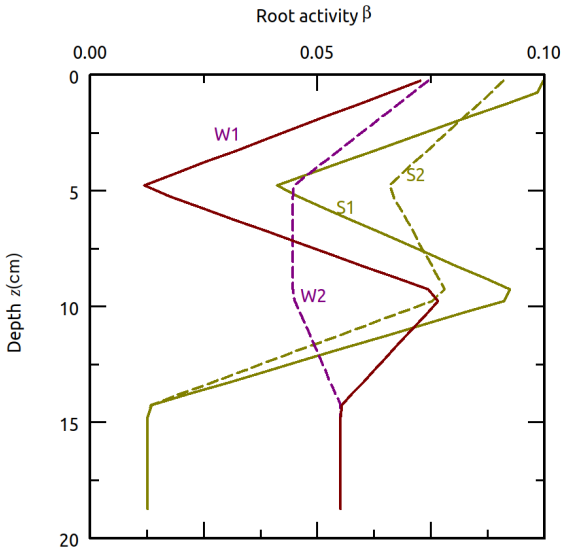


Figure 4 Profiles of root activity

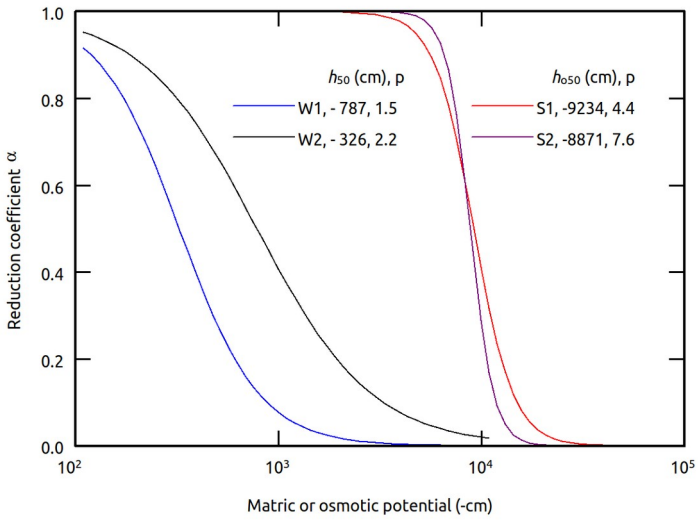


Figure 5. Stress response function for chickpea.