Hydroponics

Screening wheat for salt stress tolerance can be a useful tool for breeders and researchers. An efficient and low-cost protocol was developed by Bado *et al.* (2016) and is used at ICARDA for screening of wheat. The protocol summarized here and pictures in figure 1 are from screens performed at ICARDA (2018) by Sanchez-Garcia.

Wheat (or Barley) seeds can be germinated as described in "Growing Wheat". Once the seedlings develop 3-6 seminal roots they can be placed into the hydroponic tanks (see Fig. 1A). These tanks are made of a sturdy plastic and covered by a metal or PVC platform containing round holes of equal size and distribution. One option are 70 holes of 2 cm diameter (Fig. 1A).

Nylon mesh (fly netting) is cut to fit the platform and glued to the underside of the platform. The hydroponic tanks can then be placed in a greenhouse, growth chamber or similar. The tanks should be filled with Hoagland solution (see Hoagland and Arnon 1950) so that the mesh is touching it, but the platform's upper side is dry. The solution must be replenished as needed and the pH should be checked every 2-3 days. The hydroponic tanks should also contain a system for continuous solution homogenization, for example aquarium pumps.

If desired, a salt stress can be applied after the plants reached the 2-leaf stage (Fig. 1B), either by moving the trays to hydroponic tanks containing the desired salt concentration or by adding salt in daily increments of 25 mM. Common for wheat are salt concentrations of 50-200 mM, with 200 mM being a lethal dose to most accessions. After salt application, the plants are grown for another 15-30 days, aft which it is recommended to record the length, wet weight and dry weight of the complete root and shoot (Fig. 1C).

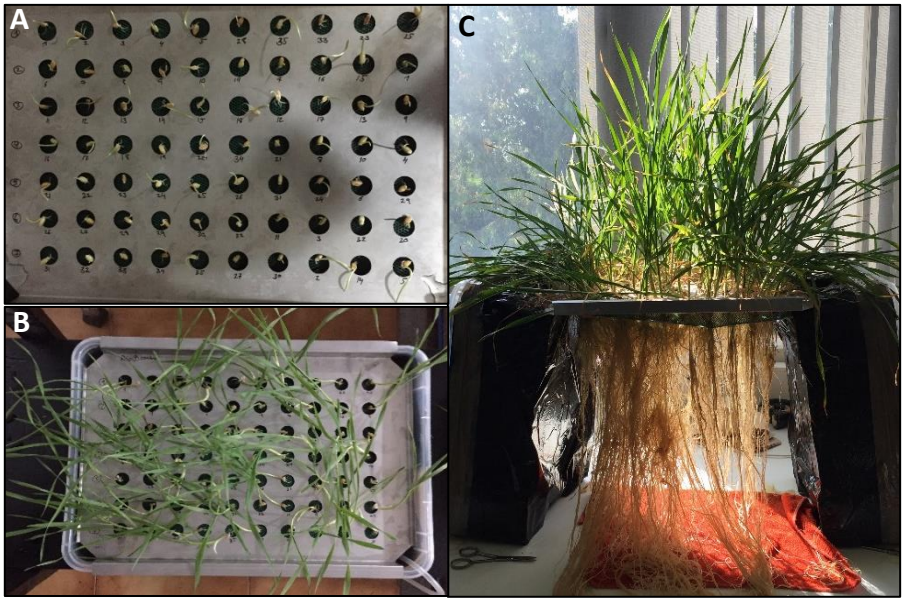

Fig 1: wheat seedlings grown in hydroponic boxes from day 0 (A) until day 30 (C). Salt was applied at 2-leaf stage (B). Source: ICARDA (unpublished data)

References:

Hoagland DR, Arnon DI (1950) The water culture method for growing plants without soil College Agriculture circular No. 347, College of Agriculture, University of California, Berkeley

Bado et al. (2016) Protocols for Pre-Field Screening of Mutants for Salt Tolerance in Rice, Wheat and Barley, Springer, Available at: https://link.springer.com/content/pdf/10.1007/978-3-319-26590-2.pdf