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ECOLOGICAL AND PHYSIOLOGICAL STUDIES ON *BETA VULGARIS* L. VAR. RAPA IRRIGATED BY SEA WATER

THESIS

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INTRODUCTION

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The ultimate goal of plant ecophysiologists is to understand how environment and physiological processes interact to determine the growth and reproduction of plants. One of the most important environmental factors is the soil salinity.

It is probably as early as 1937 until very recently, the literature has been reported on extensive work dealing with the quality of irrigation water, soil salinity and salt tolerance of plants. Though, most of the articles reveal some significant findings which fall into certain more or less well defined interests.

However, not much work is reported on the interrelationships of sea water modification to render it suitable for some sort of irrigation.

The fact remains that no conventional agricultural crops are yet grown with undiluted sea water, even on sand dunes (O'Leary *et al.*, 1985 and Pasternak *et al.*, 1985). They reported that the successful sea water irrigation depends on the use of halophytes and development of these plants for the coverage of some forage or fodder requirements (O'Leary, 1985 and Gallagher, 1985).

The water from the sea can be used to supplement agricultural water supplies, but only under very special conditions. Sea water irrigation would be feasible in coarse texture soils at different dilution levels, depending on the variations extent of salt tolerance in the plants, for the production of some crop plants (Boyko, 1966; Abaza *et al.*, 1974; Shumakov *et al.*, 1975; Soliman *et al.*, 1978; Ahmed *et al.*, 1979, 1980; Rush *et al.*, 1976, 1981; and Somera, 1979).

Salt stresses in nature are largely due to sodium salts, particularly NaCl. Ecologically plants can be divided into basically two groups, namely: halophytes; plants that can grow in the presence of high concentration of sodium salts, and glycophytes; plants that cannot grow in the presence of high concentration of sodium salts. Salt injury may result from primary salt injury or secondary stresses arising from high concentrations of salt. In case of primary salt injury, the damage to plants such as leaf burning results from rapid accumulation of Cl^- (Ehlig, 1964; Tagawa and Ishizaka, 1963). The secondary stress is an osmotic stress resulting from a lowering of the external water potential below that of the cell, thus exposing the cell to a secondary water deficit stress and further deficiency stresses such as potassium deficiency due to hight NaCl as observed by Solovow (1969) in pumpkin and sweet clover. Solovow (1969) in further experiments concluded that salt stress led to difficulty in uptake of mineral nutrients due to competition with sodium.

Experiments carried out by Loger werff & Eagle (1962) Janes (1966) Zhiemuratov (1967) Parmar & Moore (1968) Petrasovits (1968) Prisco & Leary (1970) and Udovenko & Alekseeva (1973) supported the "physiological dryness" hypothesis indicating that the reduction of growth by salinization is a consequence of reduced water absorption and metabolism as a result of the increased substrate concentration.

Neiman & Poulsen (1967) emphasized that salt stunted plants are closely comparable to drought affected plants, morphologically and anatomically. Similar conclusions were approached by Kramer (1959), Kramer & Kozlowski (1960), Jarvis (1963) and Kozlowski (1964) who emphasized that increased total soil moisture stress, due to salinity, was associated with increased leaf water deficits, decreased transpiration rate, and decreased growth.