

EFFECT OF N ON BIOMASS AND Na AND K IONS IN LEAVES OF SUNFLOWER  
AT DIFFERENT SOIL ESP LEVELS

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ABSTRACT

A pot experiment was conducted at NARC to examine the effect of N (0, 100 and 200 mg N kg<sup>-1</sup> soil) and ESP levels (control, 20 and 40) on the growth and composition of two sunflower varieties. Soil ESP levels were developed in a loam soil using NaHCO<sub>3</sub>. Biomass production in cv. NSH-45 was more than NK-212. Yield reduction for cv. NSH-45 was 7.5 and 23.3 % and for cv. NK-212 was 12 and 26 % at ESP of 20 and 40 respectively. Correlation between dry matter yield and ESP was negative and highly significant ( $r = -0.981$ ) for both the cv. NSH-45 and cv. NK-212. Sodium concentration in leaves increased and that of potassium decreased with an increase in ESP. However, reverse was true with increasing N application. Sodium and Na:K ratio had highly significant negative correlation with yield for cv. NK-212 ( $r = -0.96$  and  $-0.99$ ) and for cv. NSH-45 ( $r = -0.99$  and  $-0.99$ ) respectively. The variety NSH-45 was a little more tolerant than NK-212 variety. Application of N improved dry matter yield indicating that fertilizer N had moderated the hazardous effect of sodicity.

INTRODUCTION

High exchangeable sodium is the main barrier to crop production in nearly 1.2 mha of sodic soils of Pakistan (Muhammed, 1990). High pH in the presence of carbonates, specific ion toxicity and poor soil physical properties or their combination further accentuate the problem. Crop grown on these soils invariably suffer serious yield reductions (Qadar, 1995; Feigin, 1985). Nutrient imbalance (Ca, K and

of ammonium sulphate reduced sodium and chloride uptake in three rice cultivars. Reduced Na translocation to shoot thus can be used as an index of salt tolerance in rice (Ramani and Kannan, 1986). In some later studies, (Silberbush and Lips, 1991), increasing proportions of NH<sub>4</sub> in soil decreased concentration of Na in wheat tissues. Ammonium-N applied thus ameliorated plant growth by narrowing Na/K ratio.

Sunflower is a promising oilseed crop in Pakistan. It is grown on an area of about 86 thousand hectares (GOP, 1996). Information about tolerance of sunflower to exchangeable Na is controversial. Work done by some scientists indicate that sunflower is a fairly salt tolerant plant (Bhattacharya *et al.*, 1995; Iwasaki, 1987). However, other workers (Rhoades and Loveday, 1990; Maas, 1990) designate it as highly sensitive to salts. Fertilization of crops with N has been advocated to alleviate growth inhibition by sodicity. Therefore, the aim of this study was to investigate the effect of nitrogen on dry matter, sodium and potassium content in leaves of sunflower at different ESP levels.

MATERIALS AND METHODS

The study was carried out in polyethylene pots with sunflower varieties "NSH-45" and "NK-212" grown in greenhouse. Bulk soil sample (0-15 cm depth) of Nabipur series (Coarse loamy, mixed, hyperthermic Typic Camborthids) was collected from National Agricultural Research Center, Islamabad. The soil was loam in texture having pH of 7.9, EC<sub>e</sub> of 1.45 dS/m, SAR 1.4, total N 0.035%, organic matter