

EFFECT OF DIFFERENT CONCENTRATIONS OF SODIUM CHLORIDE (NaCl) ON THE VEGETATIVE GROWTH OF THREE VARIETIES OF COWPEA (*Vigna unguiculata* L.)

By

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Abstract

In this study effect of different concentrations of Sodium Chloride (NaCl) on the vegetative growth of cowpea (*Vigna* sp.) varieties (Ife-brown, IT90K-82 and IAR-48) were studied. The experiment was arranged in a complete randomized design in the biological garden of Kwara State College of Education, Ilorin. Sodium chloride was applied to the plants at 10, 20 and 30g/l. The shoot growth of cowpea varieties were inhibited by salt stress. NaCl significantly decreased leaf production, leaf number and leaf area. The result showed that in all the varieties of plants studied, as the concentration of NaCl increases, there was progressive reduction in the parameters measured. Among the cowpea varieties studied, IAR-48 was the most sensitive to salt treatment while Ife-brown showed better results followed by IT90K-82 in respect to salt tolerance.

INTRODUCTION

Salinity is the saltiness or dissolved salt content of a body of water. It is a general term used to describe the levels of different salts such as sodium chloride, magnesium and calcium sulfates, and bicarbonates (World Ocean Atlas 2005). Salinity is an ecological factor of considerable importance influencing the kinds of plants that will grow either in a water body, or on land fed by water or by a ground water (Kalcic *et al.*, 2011). Soil salinity is the salt content in the soil. Increasing salinity is one of the most significant environmental problems facing the world especially the tropics.

Salinity and drought are the two major environmental factors that currently reduce plant productivity (Serrano *et al.*, 1999), and these stresses cause similar reactions in plants due to water stress. These environmental concerns affect plants more than is commonly thought. For example, the effect of disease and insect typically decrease crop yields by less than ten percent, but abiotic stresses, such as drought, salinity, extreme temperatures, chemical toxicity and oxidative stress are serious threats to agriculture and result in the deterioration of the environment. Abiotic stress is the primary cause of crop loss worldwide, reducing average yields for most major crop plants by more than 50% (Boyer, 1982). One of the most important abiotic factors limiting plant germination and early seedling stages is water stress brought about by drought and salinity (Almomsouri, Kinet and Lutts 2001), which are widespread problems around the world.

There are global constraints on fresh water supplies, and this has led to a surge of interest in reusing water (Shannon and Grieve, 1999). However, in many cases the value of water has decreased because the water is salty. There is evidence that irrigation systems and type of irrigation water have contributed to a large extent in converting arable lands to saline lands (Ashraf and McNeilly, 2004). Hence, salt stress can be a major challenge to plants. It limits agriculture all over the world, particularly on irrigated farmlands (Rausch, 1996).

Salinity, due to over-accumulation of NaCl, is usually of great concern and the most injurious factor in arid and semi arid regions. Despite the essentiality of chloride as a micronutrient for all higher plants and of sodium as mineral nutrient for many halophytes, salt accumulation may convert agricultural areas in to unfavorable environments, reduce local biodiversity, limit growth and reproduction of plants and may lead to toxicity in non salt-tolerant plants, known as glycophytes (Marschner, 1995). Most of the cultivated plants are sensitive to salt stress, in which NaCl - salinity causes reduction in vegetative growth, the rate of photosynthesis (Erdal *et al.*, 2000, Neto *et al.*, 2004) and also water availability and imbalance in nutrient uptake by plants (Pessaraki and Tucker, 1988).

Salinity is one of the most important abiotic stress factors limiting plant growth and productivity (Khan and Panda, 2008). Salinity affects almost every aspect of the physiology and biochemistry of plants and significantly reduces yield. High exogenous salt concentrations affect seed germination, water deficit, cause ion imbalance of the cellular ions resulting in ion toxicity and osmotic stress (Khan *et al.*, 2002; Khan and Panda, 2008).

The ability of plants to survive and maintain their growth under saline conditions is known as salt tolerance. This is a variable trait that is dependent on many factors, including the species of the plant, genotype, plant age, ionic strength and composition of the saline solution, and the organ in question. Plants are classified based on tolerance to saline conditions into glycophytes that are sensitive to salt, and halophytes which survive in very high concentrations of salt (Volkmar *et al.*, 1998).

Characters like yield, survival, vigor, leaf damage and plant height, have been the most commonly used criteria for identifying salinity tolerance (Shannon, 1984).

Cowpea belongs to leguminous plant with edible seeds contained in long, narrow and dehiscent pods that developed from pundles (Arthur, 2009). According to Henshaw (2008), Nigeria is the largest producer of cowpea. It completes its life cycle within a season, making it to be an annual crop. It exhibits various growth habit such as erect, twining, climbing, semi-erect and prostrate depending on the species. The leaves are alternate, trifoliate usually green in colour but brown when dry and the leaflets are ovate shaped and large.

Cowpea serves as a major cheap and efficient source of needed protein to balance human diet in tropics particularly Nigeria. In which the foods are mainly made up of cereals, roots and tubers.

Cowpea has a number of common names, including crowder pea, blackeyed pea, southern pea, and internationally as lubia, niebe, coupe or frijole. However, they are all the species *Vigna unguiculata* (L.) Walp, which in older references may be identified as *Vigna sinensis* (L.). The largest acreage is in Africa, with Nigeria and Niger predominating, but Brazil, West Indies, India, United States, Burma, Sri

