Several mitigation strategies have been explored to combat salinity stress, including breeding salt-tolerant genotypes, soil amendments, and exogenous application of biostimulants (Haque et al., 2021; Irin and Hasanuzzaman, 2024). Among these, hydrogen peroxide has gained attention as a signaling molecule modulating physiological responses under abiotic stress through activation of antioxidant defenses and osmotic adjustment mechanisms (Kesawat et al., 2023). Exogenous H_2O_2 application at low concentrations promotes antioxidant enzyme activities such as superoxide dismutase, catalase, and peroxidase, thereby reducing oxidative damage and improving salinity tolerance (Chattha et al., 2022). Moreover, H_2O_2 enhances nutrient uptake and water use efficiency in salt-stressed plants (Iqbal et al., 2023).

However, while H_2O_2's role in mitigating salinity effects has been studied in several crops, its influence on maize performance under saline conditions remains underexplored. Given maize's critical role in food security and its vulnerability to salt stress, there is a pressing need to evaluate the potential of hydrogen peroxide as a sustainable management option for salinity mitigation in maize cultivation. This study, therefore, aims to assess the effect of H_2O_2 application on growth, yield, and grain nutritional composition of maize subjected to varying levels of salinity stress.

2 Materials and Methods

2.1 Location of the experiment

This experiment was carried out at the screen house of the Department of Plant Science & Biotechnology (PSB), Adekunle Ajasin University, Akungba-Akoko (AAUA), Ondo State, Nigeria (latitude 7.2 ^{0}N, longitude 5.44 ^{0}E).

2.2 Sources of materials for the experiment

Seeds of *Zea mays* (maize) were obtained from the Federal College of Agriculture, Akure, Ondo State (FECA), Nigeria. The salt (NaCl) and Hydrogen peroxide (H_2O_2) were obtained from the laboratory, and the soil used for planting was collected from the experimental plots of PSB Department, AAUA. The soil was analyzed for physical and chemical properties using the standard methods of AOAC (1985). It was shade-dried and passed through a 2-mm sieve. Total N was analyzed using the macro Kjeldahl procedure; organic carbon by Walkley and Black procedure with percentage derived by multiplying organic carbon content by 1.72; and pH using soil: water ratio of 1:2 with a pH meter. Available phosphorus was got through the Bray 1 method; exchangeable acidity by titration method; exchangeable K, Na, Ca, Al and Mg by extraction with 1 M ammonium acetate at pH 7.0; and the amount of K and Na was measured using a Corning Flame Photometer with appropriate filter, while Ca, Al and Mg were determined using a Perkin-Elmer Atomic Absorption Spectrophotometer (AAS). The electrical conductivity was read with a conductivity meter.

2.3 Soil collection and preparation

Topsoil (0~15 cm depth) was collected from an arable farmland within the premises of Adekunle Ajasin University, Akungba-Akoko, Ondo State. The soil was sieved to remove debris and thoroughly mixed to obtain a homogeneous medium. Approximately 14 kg of prepared soil was placed into each perforated polythene pot. Maize was grown in perforated polythene pots filled with 14 kg of the prepared topsoil. Three maize seeds were sown per pot, and seedlings were allowed to establish before thinning to one seedling per pot prior to the commencement of treatments.

2.4 Experimental setup

A total of 96 pots were grouped into two (Groups A and B), each consisting of 48 pots. The potted soils on which the maize seedlings were grown were irrigated three weeks after planting with sodium chloride (NaCl) solution at concentrations of 0 (control), 50, 100, 150, 200, and 250 mM three times in the week of planting. Each potted soil in Group A received 50 ml of 3% hydrogen peroxide (H_2O_2) solution the following week equivalent to 882 mM, while pots in Group B received no H_2O_2 treatment. All pots were watered to saturation and allowed to drain once per week to prevent salt accumulation beyond intended concentrations. Pots were arranged in a completely randomized design with eight replicates per treatment in the screenhouse.