root oxygen supply and the compact design for urban and small agriculture (Puerta et al., 2007; Baiyin et al., 2021). NFT systems facilitate continuous nutrient supply and enable the adjustment of nutrient concentrations in real time, which are tailored to specific growth stages, which improves growth, the yield and quality of leaf vegetables such as swamp cabbage (Ahmed et al., 2022; Shah et al., 2023).

The versatility of NFT systems, including temperature regulation and scalability, deals with seasonal stress and improves production efficiency, decisively for the variable climate Bangladesh (Payumi et al., 2022; Das et al., 2022). In addition, the NFT cultivation reduces work in connection with soil preparation and weeds and offers an inexpensive and sustainable alternative to the traditional floor base (Kumar et al., 2023).

In Bangladesh, swamp cabbage is promising due to its adaptability in agrocological zones and fast growth cycle for improving nutritional security and nutrition. Traditional swamp coal cultivation is based on swampy countries, but hydroponic NFT systems can change production by enabling year-round growth in rural and urban environments in the middle of the challenges of land deterioration and climate variaability (Reddy et al., 2022; Ahmed et al., 2023).

This study evaluated three swamp cabbage (*Ipomoea aquatica*) cultivars—BARI Swamp Cabbage-1, La Procesa Swamp Cabbage-1, and Nice Green—under a Nutrient Film Technique (NFT) hydroponic system during the pre-monsoon and summer seasons in a net-house environment. Growth characteristics, yield components, and key quality traits were systematically assessed to compare cultivar performance under NFT conditions. The primary objective was to identify high-yielding and high-quality swamp cabbage cultivars suitable for NFT hydroponic production, thereby providing a scientific basis for cultivar selection and promoting sustainable and efficient hydroponic cultivation in Bangladesh and similar agro-ecological regions..

2 Materials and Methods

The experiment was took place at the Hajee Mohammad Danesh Science and Technology University's net house in Dinajpur, in the department of horticulture. The experiment aims to give the required information under a number of subheadings pertaining to the instruments and supplies utilized in the current study as well as the procedures employed.

2.1 Experimental site and conditions

The experiment was conducted in the net house and laboratory of the Department of Horticulture, Hajee Mohammad Danesh Science and Technology University (HSTU), Dinajpur, Bangladesh. The study was carried out during the pre-monsoon and summer seasons, with plant growth and yield evaluation conducted from May to July 2023, while biochemical analyses were performed from August to October 2023. The experimental site is geographically located at 25°39′ N latitude and 88°04′ E longitude, at an elevation of 37.5 m above sea level.

During the experimental period, the average maximum air temperature ranged from 32.24 °C to 34.86 °C, while the average minimum temperature varied between 26.61 °C and 28.28 °C, accompanied by high relative humidity (91.43%-92.05%). These climatic conditions are considered suitable for swamp cabbage (*Ipomoea aquatica*) growth. Monthly average temperature and relative humidity data were obtained from the Climate and Weather Department of the Bangladesh Wheat and Maize Research Institute, Noshipur, Dinajpur, to ensure accurate environmental characterization of the study period.

2.2 Experimental materials

Three swamp cabbage (*Ipomoea aquatica*) cultivars were used as experimental materials: BARI Swamp Cabbage-1 (V1), La Procesa Swamp Cabbage-1 (V2), and Nice Green (V3) (Figure 1). These cultivars were selected based on their commercial importance, yield potential, and adaptability to soilless cultivation. Seeds were procured from the local market of Dinajpur and were sown after ensuring uniformity and viability.

This experiment analyzed the morphological and biochemical characteristics of three swamp cabbage cultivars in a nutrient-film technique (NFT) system in a net house: (1) BARI Swamp Cabbage-1 (V1) is a high-yielding