

A precursor to vitamin A,  $\beta$ -carotene is essential to human health. Their improved performance at 56 DAT shows the potential of V1 and V3 as nutrient-rich cultivars. Our results are consistent with those of Rahman et al. (2019), who emphasized the genetic basis for  $\beta$ -carotene accumulation in green vegetables. V3 is a strong choice for systems that prioritize stable nutritional quality over extended growth periods, as seen by its consistent performance.

### 3.15 Ascorbic acid content

With 14 DAT (1.77 mg/100 g), V1 Bari Swamp Cabbage-1 had the highest ascorbic acid content, while V3 (beautiful green) had the best ascorbic acid retention at 56 DAT (1.92 mg/100 g). On all days after the transplant (DAT) there were remarkable differences in the ascorbic acid level between swamp cabbage varieties (Table 16). These results suggest that V3 can be a better choice for the production of nutrient-rich plants, especially for the ascorbic acid content. V3 was better than other varieties at 56 DAT and demonstrated its ability to capture himself over time. The ascorbic acid content of V2 (LP-1) was greatest at 28 DAT (1.98 mg/100 g), followed by V3 (2.00 mg/100 g).

Table 16 Ascorbic acid content of swamp cabbage cultivars at different days after transplanting (DAT)

| Cultivar   | Ascorbic Acid mg/100 g |        |         |        |
|------------|------------------------|--------|---------|--------|
|            | 14 DAT                 | 28 DAT | 42 DAT  | 56 DAT |
| V1         | 1.77 a                 | 1.76 b | 2.06 NS | 1.72 b |
| V2         | 1.47 b                 | 1.98 a | 2.03    | 1.62 c |
| V3         | 1.50 b                 | 2.00 a | 2.01    | 1.92 a |
| LSD (0.05) | 0.12                   | 0.09   | 0.08    | 0.05   |
| CV (%)     | 3.71                   | 2.48   | 2.22    | 1.51   |

Note: V1 = BARI swamp cabbage-1; V2 = La procesa swamp cabbage-1; V3 = Nice green swamp cabbage; NS = Non-significant. Means in the same column with different letter(s) are significant at the 0.05 level of probability

This factor is important to find out the health advantages of the harvest. The potential of V3 for nutritional applications is highlighted by the reported variations of the ascorbic acid level between varieties. V3 and other varieties can be particularly useful in markets in which nutritional quality and yield are given the same weight (Ahmed et al., 2022).

## 4 Discussion

The present study demonstrated clear varietal differences in growth, yield, and quality traits of swamp cabbage cultivated under a Nutrient Film Technique (NFT) hydroponic system, highlighting the strong influence of cultivar selection on hydroponic performance. The superior growth and yield performance of BARI Swamp Cabbage-1 (V1) suggests that this cultivar possesses higher adaptability to NFT conditions, likely due to its efficient nutrient uptake, vigorous vegetative growth, and effective utilization of water and dissolved nutrients. Similar cultivar-dependent responses under hydroponic systems have been reported in leafy vegetables, where genotypic variation significantly influences growth dynamics and biomass accumulation.

The consistently higher plant height, leaf area, and fresh weight observed in V1 may be attributed to its enhanced photosynthetic capacity and rapid canopy development, which allow more efficient light interception under protected cultivation. NFT systems provide continuous nutrient availability and oxygenated root zones, which favor cultivars with high metabolic activity and rapid nutrient absorption. Previous studies on hydroponically grown leafy vegetables have reported that cultivars with larger leaf areas and faster growth rates tend to produce higher yields due to increased photosynthate production and translocation.

Although Nice Green (V3) produced a slightly lower yield than V1, it exhibited superior quality attributes, including higher vitamin C, chlorophyll-a, and  $\beta$ -carotene contents. These findings suggest that V3 prioritizes biochemical and nutritional compound accumulation rather than maximum biomass production. Enhanced chlorophyll content indicates efficient photosynthetic pigment synthesis, while increased  $\beta$ -carotene and vitamin C levels reflect improved antioxidant capacity. Similar trade-offs between yield and nutritional quality have been