We investigate a basisity problem in the space $l_{A}^{p}(D)$ and in its invariant subspaces. Namely, let $W$ denote a unilateral weighted shift operator acting in the space $l_{A}^{p}(D)$, $1 \leq p < \infty$, by $Wz = \lambda_{n}z^{i+n}$, $n \geq 0$, with respect to the standard basis $\{z^{i+n}\}_{n \geq 0}$. Applying the so-called "discrete Duhamel product" technique, it is proven that for any integer $k \geq 1$ the sequence $\{(w_{i+nk})^{kn}(W|E_{i})^{kn}f\}_{n \geq 0}$ is a basic sequence in $E_{i} := \text{span}\{z^{i+n}:n \geq 0\}$ equivalent to the basis $\{z^{i+n}\}_{n \geq 0}$ if and only if $f(i) \neq 0$. We also investigate a Banach algebra structure for the subspaces $E_{i}$, $i \geq 0$. 