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On certain transformation formulae involving basic hypergeometric functions

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Abstract: In this paper, we establish certain transformations for unilateral as well as bilateral basic hypergeometric functions.
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1. Introduction, Notations and Definitions

Somashekara and Fathima [2], in order to establish certain continued fraction representation for the ratio of two ${}_2\Psi_2$, established certain functional relations satisfied by ${}_2\Psi_2$, with the help of certain simple identities. In this paper we discuss how these identities can be utilized to establish interesting transformations involving basic hypergeometric functions which may prove useful in the study of transformation theory of q-series.

$$[\alpha;q]_n = [\alpha]_n = \begin{cases} (1-\alpha)(1-\alpha q)(1-\alpha q^2)...(1-\alpha q^{n-1}); & n>0 \\ 1; & n=0 \end{cases}$$

$$[\alpha;q]_\infty = \prod_{r=0}^{\infty}(1-\alpha q^r) \qquad \text{and} \qquad [\alpha;q]_{-n} = \frac{(-)^n q^{n(n+1)/2}}{\alpha^n[q/\alpha;q]_n}$$

Following the above notation,we define

$$ {}_r\Phi_s\left[\begin{array}{l} a_1,a_2,...,a_r;q;z \\ b_1,b_2,...,b_s \end{array}\right] = \sum_{n=0}^{\infty}\frac{[a_1,a_2,...,a_r;q]_n z^n}{[q,b_1,b_2,...,b_s]}, \tag{1.1}$$

max. $(|q|,|z|<1)$. where

$$[a_2,a_2,...,a_r;q]_n = [a_1;q]_n[a_2;q]_n...[a_r;q]_n.$$

Also, we define the basic bilateral hypergeometric function

$$ {}_r\Psi_r\left[\begin{array}{l} a_1,a_2,...,a_r;q;z \\ b_1,b_2,...,b_r \end{array}\right] = \sum_{n=-\infty}^{\infty}\frac{[a_1,a_2,...,a_r;q]_n z^n}{[b_1,b_2,...,b_r]_n} \tag{1.2}$$