**Genetic diversity in nutritional and phytochemical compositions of cowpea [*Vigna unguiculata* (L) Walp] germplasm tested under dryland farming system in South Africa**

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The identification of potential cowpea (*Vigna unguiculata* (L) Walp) genotypes with dense grain nutritional and phytochemical compositions is key to improve global food and nutrition security. This study aimed at identifying cowpea genotypes possessing suitable grain nutritional and phytochemical compositions for consumption, production and breeding. The responses of 50 cowpea genotypes cultivated under dry land farming system were studied using grain nutritional [i.e., calcium (Ca), copper (Cu), iron (Fe), potassium (K), magnesium (Mg), sodium (Na), phosphorus (P), zinc (Zn), protein, and fat] and phytochemicals [i.e., phenols, flavonoids and condensed tannins (cond. tannins)]. The genotype-by-environment interaction effect was significant (*p* ≤ 0.05) for all studied traits except flavonoid contents. Pearson’s correlation (*r*) analysis revealed the following positive and significant (*p* ≤ 0.001) correlations: Ca correlated with Mg (*r* = 0.92), P with Zn (*r* = 0.33) P with Na (*r* = 0.83) and Fe with Ca (*r* = 0.69). Negative and significant (*p* ≤ 0.001) correlations were recorded between phenolic content and Ca (*r* = -0.40), Na with K (*r* = -0.16), total phenolics with P (*r* = -0.42) and condensed tannins with K (*r* = -0.35). Based on principal components analysis (PCA), the genotypes G10, G12, G24, G29 and G47 were superior for Ca, Fe, Mg, Na and P contents, while G14, G23, G25, G27, G30, G34, G45 and G50 associated with increased phenolics content. The genotypes possessing desired grain nutritional and phytochemical compositions were recommended for consumption, cultivation and breeding.

**Key words**: Cowpea, genotype-by-environment interaction, grain, macro- and micro-nutrients, phytochemicals,