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Proximate, mineral, and anti-nutrient compositions of underutilized plants of Ethiopia: Figl (*Raphanussativus* L.), Girgir (*Eruca sativa* L) and Karkade (*Hibiscus sabdariffa*): Implications for in-vitro mineral bioavailability

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In Ethiopia, particularly in the Benishangul-Gumuz region, there are several underutilized plants like Figl (*Raphanussativus*), Girgir (*Eruca sativa*) and Karkade (*Hibiscus sabdariffa*) which are cultivated and consumed only by the local communities. However, information on nutrient, anti-nutrient contents and mineral bioavailability of edible parts of these plants are limited. Given this, leaves and roots of Figl, leaves of Girgir, calyces and seeds of Karkade were evaluated for their proximate, mineral and anti-nutrient contents following the standard analytical methods. The result on dry matter basis revealed that protein contents (26.32 g/100 g) were high for brown seeds of Karkade, dried leaves of Figl (26.71 g/100 g) and Girgir (24.23 g/100 g). The fat and energy contents were high for seeds of Karkade (15.58–18.00 g/100 g; 371.64–376.69 kcal/100 g). The fiber content was high for dried leaves of Figl (28.39 g/100 g) and low for calyces of Karkade (15.33–16.54 g/100 g). There was a significant difference ($p < 0.05$) in terms of mineral contents. The dried leaves of Figl were high in calcium, sodium, potassium, and phosphorus contents while dried leaves of Girgir were high in iron and zinc contents. With exception of oxalate content, seeds of Karkade were low in tannin, phytate and alkaloid. The phytate: mineral ratio analysis showed the bioavailability of iron is likely to be inhibited from roots of Figl and calyces of Karkade; zinc bioavailability from calyces of Karkade which suggests processing for phytate reduction is important. The result showed the seeds of Karkade are good sources of protein, fat and energy with low antinutritional contents that may favor mineral bioavailability with potential for utilization in baby food formulations to alleviate protein energy malnutrition. The leaves of Figl and Girgir can also be exploited in different food formulations to improve macro and micronutrient deficiency.

Keywords: Antinutrient, Bioavailability, Figl, Girgir, Karkade, Minerals, Nutrient, Phytate: mineral ratio, Proximate Article published in Food Research International (ELSEIVER).

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