

## General abstract

*Dovyalis caffra* and *Dovyalis abyssinica* are examples of African indigenous fruits that remain highly unexploited for food purposes. In Kenya, the fruits are considered wild, with utilization only limited to establishment of live fences. The result of this is widespread underutilization that is worsened by limited scientific information on the fruits' physicochemical characteristics and potential for value addition in foods. The current study aimed at closing this information gap through (1) Determination of the physicochemical and phytochemical characteristics of *D. caffra* and *D. abyssinica* fruits, (2) Determination of the effect of processing and storage on the various physicochemical characteristics of the fruits and (3) Determination of the fruits potential in formulation of fruit yoghurts. In general, standard analytical procedures were used. Briefly, total soluble solids (TSS) was determined using a refractometer, total titratable acidity (TTA) by alkaline titration, ascorbic acid by indophenol titration, pH by a pH meter, colour by colourimeter, Total polyphenol content (TPC) by Folin Ciocalteu method and Antioxidant activity (AA) by 2, 2-Diphenyl-1-picrylhydrazyl (DPPH) and Cupric ion Reducing Antioxidant Capacity (CUPRAC) assays. All pasteurization procedures were conducted in a hot water bath. Basic chemical analysis of fresh fruit pulps indicated *D. caffra* species to be significantly superior to *D. abyssinica* species in terms of TSS, TSS/TTA and ascorbic acid content. The range of these parameters in all fruit samples were 10.37 – 10.97 °Brix, 4.14 – 4.76 and 109.07 – 162.95 mg/100 g respectively. Analysis of dried fruit pulp further illustrated the superiority of *D. caffra* species in the quantities of fat, protein, TPC and AA. The range of these parameters in all fruit samples were 2.55 – 3.16 mg/100 g, 3.11 – 4.56 mg/100 g, 1128 – 1845 mg gallic acid equivalent (GAE)/100 g, 1995 – 4993 mg L-ascorbic acid/100 g and 1384 – 2303 mg L-ascorbic/100 g respectively. Based on the superiority demonstrated by *D. caffra* samples, subsequent investigations were concentrated on the fruit. In variation of extraction conditions for polyphenols, aqueous extraction at 30 °C for 1 hour was established to be optimal for polyphenols in fresh *D. caffra* fruit pulp. The TPC content at this condition was found to be 91.25 mg GAE/100 g. In the investigation on pasteurization and storage conditions of *D. caffra* fruit juice, high temperature short time treatment (HTST) and low temperature long time treatments (LTLT) were shown to cause significant degradation of ascorbic acid, colour; a\* (redness), b\* (yellowness) and C\* (chroma), accompanied by significant rise in the TSS and h\* (hue angle) of the fruit juice samples. TPC, pH and TTA were however not affected by pasteurization. With regard to storage of the juice samples, refrigeration and ambient conditions showed no significant variations between each other except for the untreated (UT) sample. Overall, the UT showed shelf stability for up to two weeks at room temperature and beyond two weeks under refrigeration. In new product development, *D. caffra* fruit yoghurts were demonstrated to be feasible. These yoghurts were shown to be significantly higher in the contents of ascorbic acid, total polyphenols, fibre, carbohydrates, TTA, C\* and b\* in comparison to the control (plain cow milk yoghurt). These yoghurts were however significantly lower in values of fat, protein, viscosity, pH, taste, texture and overall acceptability as compared to the control. Generally, refrigerated storage of 21 days was shown to affect the pH and TTA of all yoghurt samples with minimal impact on water holding capacity (WHC), L\*. a\*, b\*, C\*, and h\*. Microbial analysis indicated absence of coliforms, yeasts and moulds in all formulations throughout the 21-day storage period. In conclusion, the current study was able to; successfully characterize the chemical properties of *D. caffra* and *D. abyssinica* fruits, establish optimal extraction conditions for polyphenols in *D. caffra* fruit, establish the effect of heat treatment and storage on the physicochemical properties of *D. caffra* fruit juice and develop *D. caffra* fruit yoghurt formulation of acceptable sensory, physicochemical and microbiological quality. Further studies on new product development using these fruits is highly recommended.