

# **Design and Performance Assessment of a Low Cost Evaporative Cooler for Storage of Camel Milk in Arid Pastoral Areas of Kenya**

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## **Abstract**

A low-cost charcoal evaporative cooler was designed and tested for the storage of camel milk in an arid pastoral area of northern Kenya. The cooler, 0.75 m<sup>3</sup> in capacity, was made of galvanised iron frame reinforced with wire mesh inside and out, leaving a 10 cm-wide cavity which was filled with charcoal. A water reservoir linked to the cooler at the top through a perforated pipe kept the charcoal continuously wet through drip system. A wind driven fan on the roof enhanced air movement through the charcoal walls by sucking out the air in the cooler. The cooler was evaluated for temperature and product response. The inside temperature was 1-11°C lower than outside temperature and inside humidity was 0-49% higher than outside. During the hottest time of the day (14.00 hrs) when cooling was most needed, the cooler consistently maintained an average temperature drop of 10.5±0.4°C below ambient temperature, which varied from 29-32°C. This reduction in temperature was 35.6% and statistically significant ( $p=0.05$ ). During this time, cooling efficiency varied between 74.2 to 86.7%. Temperature of camel milk inside the cooler did not significantly increase ( $p>0.05$ ) between morning time and evening time. However, temperature of control milk at ambient conditions significantly ( $p=0.05$ ) changed over the same period, from 22.6±0.08°C to 28.1±0.08°C. Milk inside the cooler was also significantly cooler ( $p=0.05$ ) than control milk in the evening, with a net temperature reduction of 27.0%. Total bacterial count changed from 31.4±2.1 x 10<sup>4</sup> cfu/ml to 43.1±1.9 x 10<sup>4</sup> and 1638±81 x 10<sup>4</sup> cfu/ml for test and control milk, respectively, after storage for 10 hours. As an inexpensive alternative to mechanical refrigeration, evaporative cooling technology is promising and suitable for rural application in arid pastoral areas without grid electricity, to minimise risk of milk spoilage at collection points and retail level, and thereby encourage organised women groups to get involved in milk marketing as a source of income.