Suitability of *Detarium microcarpum* (Dm) seed flour as a binder and partial fat substitute in buffalo meat loaves

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Abstract. The suitability of *Detarium microcarpum* (Dm) seed flour as a binder and partial fat substitute was investigated in buffalo (*Bubalus bubalis*) meat loaves. Buffalo meat loaves were prepared incorporating 0.5% and 1.0% Dm seed flour using two (5% and 10%) levels of fat. A control was prepared with 3% wheat semolina as the binder. Inclusion of Dm seed flour had no effect (\(p > 0.05\)) on the product’s yield, water holding capacity and consumer shrink (frying loss). The microbiological quality and the internal surface color of the meat loaves were not affected by the presence of Dm seed flour. Increased fat level reduced the consumer shrink, cooking loss and shear force significantly (\(p < 0.05\)). Increasing Dm seed flour substitution from 0.5% to 1.0% affected the textural quality of the meat loaves significantly (\(p < 0.05\)) particularly at 10% fat level. Sensory panel results showed that the 0.5% Dm product had comparable scores with the control in all the sensory attributes tested. Overall acceptability scores indicated that all the products were acceptable.

Key words: Binder, Buffalo meat loaves, *Detarium microcarpum*, Fat substitute, Shear force, Yellowness

Introduction

Non-meat ingredients added to comminuted meat formulations can be binders, extenders, fillers, emulsifiers or stabilisers. These are added to reduce cost and serve as functional ingredients [1]. Many such non-meat ingredients like flours from tubers [2], cereals [3, 4] and legumes [5–7] have been added to a variety of comminuted meat products.

Recently, the high degree of consumer demand for reduced fat foods has also led to the use of some non-meat ingredients as fat substitutes in meat products. Legumes, particularly soybeans, have been the most extensively used for this purpose. Gum and starches have also been used as partial fat substitutes.
*Detarium microcarpum* (Dm) is a less studied leguminous tropical plant widely available in the rain forest zones and drier savannah areas of Africa [8]. The seed flour of this legume has had traditional culinary applications as a thickener and an emulsifier in Nigeria and some West African countries from early times but it has remained less known as evident from the dearth of literature on the seed. Some preliminary studies on Dm seed flour revealed that it has a high level of water soluble non-starch polysaccharides and exhibits very good emulsion stabilization properties [9, 10]. However, no work has been done on the use of the seed flour in comminuted meat products. Dm seed flour has also been shown to have some physiological properties that may be useful in the treatment of diabetes melitus and other physiological disorders [11, 12]. In view of the potential of Dm seed flour as a functional food ingredient, the present study was undertaken to:

1. Evaluate the performance of Dm seed flour as a binder in buffalo meat loaf.
2. Assess the possibility of using Dm seed flour as a partial fat substitute.
3. Determine the optimal level of inclusion of Dm seed flour that will not affect the organoleptic qualities and acceptability of the substituted product.
4. Evaluate the storage stability of the products at 3 ± 1 °C in two packaging materials, polyethylene and polypropylene pouches.

**Materials and methods**

Fresh buffalo (*Bubalus bubalis*) meat (assorted leg muscles) was obtained from a local market in Mysore, India. The fresh meat was stored at –18 °C in polyethylene bags until required. Prior to use, it was thawed at 0 °C and minced through a 4 mm plate.

**Binders.** *Detarium microcarpum* (Dm) seeds were procured from a local market in Nsukka, Nigeria. The seeds were dehulled after cracking and soaking in water at room temperature (25 ± 2 °C) for 1 hr. The cotyledons were dried at 60 °C for 48 hr and ground in a hammer mill (Retsch, GmbH, Germany) into powder to pass through 52 mesh sieve. Wheat (*Triticum* spp.) semolina was procured from the pilot milling plant of the International School of Milling Technology, Central Food Technological Research Institute, Mysore, India. Hydrogenated vegetable fat (Dalda brand) and spices, [onion (200 g), ginger (10 g), garlic (40 g), green chilli (10 g), cinnamon (10 g), clove (10 g) and black pepper (10 g)] were bought from a local market in Mysore city.