



Niger: A life line of tribal agriculture in India

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Niger [*Guizotia abyssinica* (L.f.) Cass.] is an important minor oilseeds crop of tropical and subtropical ecosystems like India and Ethiopia countries, known by various names like Ramtil or Kalatil in India and Noog in Ethiopia. Niger is cultivated to limited extent in Ethiopia, India, South and East Africa. In India, it is mainly cultivated in tribal pockets of Orissa, Madhya Pradesh, Bihar, Maharashtra and Karnataka while as sizeable area in certain region of Gujarat, U.P., Rajasthan and Arunachal Pradesh. In India, South Gujarat heavy rainfall zone particularly comprising of Dang, Navsari and Valsad districts are very potential areas where this crop is already being grown to some extent. Niger seed belongs to the same botanical family as sunflower and safflower (*Compositae*). There are six species of *Guizotia* with *G. abyssinica* being the only the cultivated species. It is a dicotyledonous herb, moderately to well branched and grows up to 2 meter in height. The crop grows best on poorly drained, heavy clay soils without much more irrigation. Niger is a neglected minor oilseed crop of India, which plays significant role in the food and nutritional security of the poorest of the poor tribal segment of Indian population, hence known as lifeline of tribal agriculture and economy (Rajpurohit, 2011). Niger yields high quality edible oil with pleasant nutty sweet taste. Niger is mainly used for oil extraction (about 70%) for culinary and anointing purposes. Its oil is bluish white in colour and is a good absorbent of fragrance of flowers and thereby it is used as base oil in perfume industry. Niger oil is very much beneficial to human being. Hence, this paper summarized the chemical and biological properties of neglected and underutilized niger crop as discuss below.

Protein and its byproduct: Niger meal, remaining after oil extraction, contains approximately 30 per cent protein and 23 per cent crude fibre. In general, Ethiopian niger

meal contains less protein and more crude fibre than the niger meal from seeds grown in India (Seegeler, 1983). The protein and crude fibre contents of niger are affected by the hull thickness. Thick-hulled seeds tend to have less protein and more crude fibre. The protein content of the dehulled flour increased from 44–63 per cent. The meal was reported to be free from any toxic substance but contains more crude fiber than most oilseed meals. The utilization of niger seed proteins in human food is very limited due to the presence of a high fibre content and a

dark colour of the cake. The oil extracted from dehulled seeds was of good quality and the cake was high in protein and low in fibre.

The amino acid composition of niger protein was deficient in tryptophan.

The lipoprotein contained 4 per cent moisture, 12 per cent ash, 46 per cent protein, 20 per cent fat, 7 per cent crude fibre and 11 per cent soluble carbohydrate (Getinet and Sharma, 1996).

Oil content and its processing

: The oil content of niger varied form 30-50 per cent as per genotype and environment. Niger seeds were also reported to contain 483 calories, 2.8–7.8 per cent moisture, 17–30 per cent protein, 34–39 per cent total carbohydrate, 9–13 per cent fibre, 1.8–

9.9 g ash, 50–587 mg/100 g calcium, 180–800 mg/

100 g phosphorus, 0.43 mg/100 g thiamine, 0.22–0.55 mg/100 g riboflavin, and 3.66 mg/100 g niacin (Bhardwaj and Gupta, 1977). The oil has an attractive pale yellow colour and a nutty taste. With high levels of linoleic acid, it is very similar to sunflower and safflower oils. In India the oil is extracted by bullock-powered local 'ghanis' and rotary mills (cottage expellers) or in mechanized expellers and hydraulic presses in large industrial areas. The oil content of niger is also influenced by the hull thickness hence, dehulling is now days practiced in niger seeds for increase of both oil and protein contents (Getinet and Sharma, 1996).

Edible and non-edible uses : Niger seeds are used

fried, milled into flour, pressed with honey into cakes and for livestock feed after oil extraction while the plants are used as green manure as a type of cover crop grown primarily to add nutrients and organic matter to the soil. Niger seed is also a good bird feed. The oil can be used as a substitute for olive oil and a substitute for sesame oil for pharmaceutical purposes. In India, niger seeds are also fried, used as a condiment or consumed about 18 per cent in certain regions as food in the form of chutney mixed with chilly and spices (Patil and Duhoon, 2006). Niger seed oil can also be used in the manufacture of soap and as a lubricant or lighting fuel. The oil is also used to a limited extent in paints (being slow-drying), for which the Ethiopian seed is superior to the Indian seed as it has higher linoleic acid content. It is also used in perfumes as a carrier of the scents and fragrances (Ramdan, 2012).

Fatty acid composition : Niger seed oil has a fatty acid composition typical for seed oils of the *Compositae* family viz., safflower and sunflower with linoleic acid being the dominant fatty acid. The fatty acid composition of the seed is made of 7–8 per cent palmitic and stearic acids, 5–25 per cent oleic acid, and 55–80 per cent linoleic acid (Getinet and Teklewold, 1995). This fatty acid composition is comparable to those of safflower (*Carthamus tinctorius*) and sunflower (*Helianthus annus*) oils, which are low in saturated acids, contains virtually no n-3 acids and rich in linoleic acid (up to 70%). The Indian varieties of niger seed contains 25 per cent oleic and 55 per cent linoleic acids, with the linoleic acid per cent being lower than in seeds grown in Ethiopia (75%) (Nasirullah *et al.*, 1982). Niger seed oil contained much higher levels of tocopherol (660–850 µg tocopherol/g oil) than sunflower and safflower oil, belonging to the *Compositae* family (510 and 400 µg tocopherol/g oil), which may have resulted in great stability of the oil toward oxidation in spite of higher linoleic acid content than sunflower and safflower oils. Niger seed oil was characterized by extremely high level of vitamin K1 (more than 0.2% of TL) and β-carotene (ca. 0.06% of TL). The vitamin K1 level is very low in most foods (<10 mg/100 g), and the majority of the vitamin is obtained from a few green and leafy vegetables like spinach and broccoli. Low levels of phenolic compounds (5 mg/kg oil) were determined in the crude niger seed oil (Ramdan, 2012).

Niger oil in health care: The high level of vitamin K1 may be the most unique health promoting characteristic of niger seed oil. The significance of dietary vitamin K has recently increased. Vitamin K is a fat soluble vitamin that functions as a coenzyme and is involved in the synthesis of a number of proteins participating in blood clotting and bone metabolism. The importance of vitamin K as a blood-clotting agent is well known. Moreover, it is demonstrated that vitamin K may play a variety of health-promoting roles. Vitamin K reduces the risk of heart disease, kills cancer cells and enhances skin health and may have antioxidant properties (Ramdan, 2012). Niger seed oil appears to be nutritionally valuable, as the high content of linoleic acid is known to prevent cardio-vascular diseases and to be the precursor of structural components of plasma membranes and of some metabolic regulatory compounds. Linoleic acid may also decrease arrhythmias (Charnock *et al.*, 1991) and improve insulin sensitivity. The oil can also be used in rheumatism. A niger-based agar medium can be used to distinguish *Cryptococcus neoformans* (Sant) Vail, a fungus that causes a serious brain ailment, from other fungi (Paliwal and Randhawa, 1978). There are reports that niger oil is used for birth control and for the treatment of syphilis. In addition, niger sprouts mixed with garlic are also used to treat coughs.

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