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Niger (*Guizotia abyssinica L.*): An Underutilized Oilseed Crop with High Value

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Introduction

In addition to their usage in a variety of different industrial applications, oilseed crops are also important sources of nutrients for both people and other animals. Groundnuts [*Arachis hypogaea L.]*, soybeans [*Glycine max (L.) Merr.*], rapeseed [*Brassica napus (L.)*], and sunflower [*Helianthus annuus (L.*)] are the primary edible oil crops that command the majority of sales on the global market. The need for edible oilseed crops has expanded as a result of fast population expansion, and this demand can no longer be satisfied by just a few of the major oilseed crops. Because of this, increasing the production of alternative edible oilseed crops in addition to the major ones and making better use of them are both extremely vital in order to satisfy the markets. Ethiopia is one of the principal locations of origin and/or diversity of edible oilseed crops, which is located in Africa. These crops include Ethiopian mustard (*Brassica carinata*), niger seed

STATE	COMMON NAME
Hindi	ramtil, jagni or jatangi
Gujarati	ramtal
Marathi	karale or khurasani
Kannada	uhechellu
Tamil	payellu
Telugu	verrinuvvulu
Oriya	alashi
Bengali	sarguza
Punjabi	ramtil
Assamese	sorguja

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(*Guizotia abyssinica (L. f.) Cass.*), sesame (*Sesamum indicum L.*), and linseed (*Linum usitatissimum L.*). Numerous studies examining population genetics with molecular markers revealed a significant amount of genetic variation in these crops. These plants are cultivated primarily to produce oils that are suitable for human use and are used in the region.

Origin and distribution of niger *(Guizotia abyssinica L.)*

Niger (*Guizotia abyssinica L.), a minor* oil seed crop, contains 37–47% oil content and is used for food purposes. Niger seeds, which are indigenous to Ethiopia, Eritrea, and Malawi, are also grown in India. Using RAPD and AFLP markers, recent research has revealed regional genetic differences within niger, revealing the genetic diversity of various populations grown in Ethiopia. Niger, an oilseed crop, is mostly grown in the countries of the Indian subcontinent and East Africa. The Niger (*Guizotia abyssinica L.*), sometimes known as the "Savannah complex," is transported by Persian-Gulf traders to East Africa and India along with other crops. Despite being a native of tropical Africa, niger has been widely used and extensively farmed in India for a very long time. It accounts for around 50% of Ethiopian and 3% of Indian oilseed production.

The key differences between the Indian and Ethiopian varieties of niger are

Geographic isolation has caused the genepools of Ethiopia and India to diverge significantly in many ways

Ethiopian Niger	**Indian niger**
➢ The Ethiopian niger has a tall plant, matures later, and produces more fruit. ➢ In terms of the quantity of branches per plant and oil content, both genepools are comparable ; ➢ Ethiopian niger oil has 20% more linoleic and 20% fewer oleic acids	➢ The Indian niger blooms and matures earlier and produces more seedweight. ➢ however, the Ethiopian and Indian niger's fatty acid compositions are very dissimilar ➢ Indian niger oil has 20% less linoleic and 20% high oleic acids

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Anatomy of the plant

The niger plant is a robust, upright annual herb that can reach heights of up to 2 metres.This plant has a robust root system with a taproot and several lateral roots, especially in the top 5 centimetres. The stems are hollow, up to 2 cm in diameter, soft, hairy, and branching. Their colour is a light green that frequently has purple stains or spots and turns yellow with age. The leaves are opposing or, in some cases, alternating at the stem apex. Simple and sessile limbs are present. The lanceolate to obovate, 3-23 cm x 1-6 cm, variable-shaped leaf blade has ciliate, gently hairy margins on both surfaces and is lance late to obovate in shape. The lower leaves are a distinct yellow colour, but the upper ones are typically dark green. The inflorescences are grouped in axillary or apical cymes and are encircled by leafy bracts that can reach a length of 3 cm. The capitula-shaped flowers have a diameter of 15 to 50 mm and are bright yellow when young, turning golden yellow as they age. About 50 seeds are produced by each bloom. The seeds of small achenes (actually a fruit) are glossy black and measure 3-6 mm long by 1.5-4 mm wide.

Fig 1. Niger plant along with it's A) flower and B) seeds

Area and their distribution:

Niger farming covers 5.60 lakh ha worldwide, producing 1.52 MMT at a productivity of 271 kg/ha. It is mostly grown in Central and South Africa, Ethiopia, Nepal, Germany, Switzerland, France, the USSR, Sudan, Uganda, Tanzania, Malawi, and Zimbabwe. India is

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the most significant nation, accounting for more than 50% of global niger production and area. India leads the globe in terms of niger export volume, production, and area. Niger is cultivated on 2.52 lakh hectares in India, producing 0.85 MMT at a productivity of 337 kg/ha. India could earn 100 crores of rupees from the export of niger seed and oil meal. India is the world's greatest exporter, and regular customers include the United States, the Netherlands, Italy, Germany, Belgium, and Spain.

It is largely farmed in India on degraded soils in remote, hilly, and tribal areas on an area of around 3 lakh hectares, with bigger areas in Chhattisgarh, MP, Maharashtra, and Odisha. Without the use of chemicals, it can be effectively grown. Even in conditions of low soil fertility, wetness, and ineffective crop management, the crop can produce a higher yield and has strong resilience to biotic influences.

Oil composition

Niger seeds contain about 40% edible oil with fatty acid composition of

75-80%	linoleic acid,
7-8%	palmitic and steric acids, and
5-8%	oleic acid

The applications of niger oil

- The oil is used to make paints, soft soaps, lights, lubrication, and other products.
- Also, niger seed oil is good for the health of the public as a whole because it contains small amounts of compounds like tocopherols, phospholipids, and sterols that protect against cancer and heart disease (Ramadan and Morsel, 2003).
- Niger seed oil helps with coughing, wheezing, and other lung conditions, as well as treating asthma. Along with helping with skin and hair issues, it also benefits heart health and sleep. It lessens inflammation and quickens the healing process.
- Niger seed cake is an excellent source of animal feed, especially for milch cattle.
- Linseed cake could be substituted with niger meal, which has 17% crude fibre and 30% protein in India.
- Because finches, notably the goldfinch and the greenfinch, love it, it is offered for sale as bird seed (Chloris). In the birdseed business, niger is often sold as thistle seed, and it can be changed so that it contains rapeseed, sesame, or linseed oil instead of olive oil.

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- Cooking is done with oil. Niger oil has a long shelf life and contains up to 70% unsaturated fatty acids that are free of toxins. Health experts believe the oil is beneficial.
- Anti-parasitic and antioxidant effects are present in niger seed oil. The combination of these two qualities can greatly increase the potency of immunity.
- Omega-3 fatty acids and linoleic acids can both be found in niger seed oil. These fatty acids provide the heart with protection against heart attacks, atherosclerosis, cardiac arrhythmia, ventricular hypertrophy, chest pain or angina, etc.
- Magnesium is mostly obtained from niger seed oil. For cardiac health, magnesium is beneficial. Increasing blood pressure is prevented by magnesium, which also affects blood pressure. In order to maintain healthy circulation, it controls blood flow by regulating proper pressure.
- The amino acids, fatty acids, and antioxidants in niger seed oil can help with digestive problems like constipation, bloating, cramps, piles, and stomach aches.
- Because it is so high in antioxidants, niger seed oil is a fantastic treatment for a variety of skin disorders. Skin issues like scabies, burns, wounds, syphilis, rashes, and skin irritation are all treated by the antioxidants in niger seed oil.

Breeding purposes

- The niger must greatly increase its seed yield in order to compete with other oilseed crops. To accomplish this goal, single-headed, dwarf varieties that mature uniformly and experience fewer shattering losses must be produced.
- Boosting the seed oil content is the second most crucial breeding goal for niger development.

Breeding strategy

The pollination habits of the niger must serve as the foundation for any genetic improvement initiative. The breeding approaches used to improve cross-pollinating crops are the ones used for niger breeding because of its self-incompatibility. According to conventional plant breeding, recurrent selection is the normal breeding method for cross-pollinating crops. A potent tool for crop development is mass selection. This method has been successfully used in niger to create a short plant variety with an early to medium maturation stage. The resulting variety (Kuyu) produced noticeably more yield than typical

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niger types and matured nine days quicker. It was also 10 cm shorter in height. The niger's pollination behaviour is comparable to that of the sunflower. Thus, the niger is a superb candidate for the production of hybrid varieties. The discovery of hereditary male sterility in Ethiopia and India has made it possible to use heterosis in niger. India investigated the seed yield of six hybrids based on genetic male sterility, parents, and regional and national check varieties. The hybrids showed 15–55% heterosis over mid-parent yields and 10–30% heterosis over the superior parent for seed output. Disease concerns will grow as modern high-yielding, genetically homogeneous cultivars spread, necessitating a greater focus on disease resistance breeding. Guizotia species found in the wild may contain disease resistance genes that can be crossed with cultivated species to introduce those genes.

Conclusion:

A member of the Asteraceae family, the niger plant *(Guizotia abyssinica)* has bright yellow blossoms. It is mostly grown in Ethiopia and India and is a significant oilseed crop with therapeutic qualities. Niger seed is used as a human dietary source. Moreover, it is a commercially significant edible oil crop. It greatly impacts the human diet by serving as a large source of protein, carbohydrates, vitamins, and fiber. Niger seed can be used to treat rheumatoid arthritis. The use of niger seed is an innovative biological strategy for combating pests like nematodes and arthropods. Poultices made from niger seed can be used to treat pain, itching, swelling, inflammation, abscesses, boils, and other skin problems. Poultices made from Niger seeds are the most effective treatment for a variety of ailments. the backbone of tribal agriculture and commerce; maximum productivity and the world's greatest area; the highest possible level of exports to foreign markets; excellent bird feed; high export potential; low susceptibility to illnesses and pests; The advantage is low input requirements and effective growth without expensive chemicals. Low harvest indices and low yield levels low rate of upgraded technology's transfer and acceptance, and this crop is highly vulnerable to Cuscuta. best plant to grow on waste land; honeybee production increases profitability and productivity; it also aids in the restoration of degraded land and the conservation of soil; and due to the allelopathic impact, weeds are suppressed. It has a ghee-like flavour and is good for our health.

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