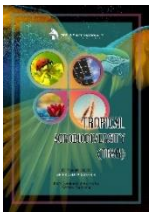
ZIBELINE INTERNATIONAL™ PUBLISHING

ISSN: 2716-7046 (Online)
CODEN: TARGCA

Tropical Agrobiodiversity (TRAB)

DOI: http://doi.org/10.26480/trab.02.2022.47.51



RESEARCH ARTICLE

PRODUCTION AND COMMERCIALIZATION OF NIGELLA *(Nigella sativa L.)*

Prakash Awasthi*

Institute of Agriculture and Animal Science, Tribhuvan University, Nepal
Corresponding Author Email: prakashawasthi82@gmail.com

ARTICLE DETAILS

Article History:

Received 28 July 2022
Accepted 10 August 2022
Available online 12 August 2022

ABSTRACT

Because of its relevance in health, pharmaceuticals, spices, and income-earning, nigella is now used all over the world. This crop is grown all over the world. Even though nigella is essential, the yield and productivity per hectare in Nepal in comparison to other countries is quite low. The lack of better variety, lack of fertilizer management, lack of knowledge of cultural methods, and illnesses and insect pest management are all blamed for the lower yield. By examining such issues, a solution for nigella's low productivity can be devised. As a result to address such problems a review is done on fertilizer requirements, the adaptation of available cultivars, agronomic practice recommendations, disease, and insect pest management, and other topics that are beneficial from the farmer's point of view.

KEYWORDS

Benefits, Black Cumin, Flavor, Nigella, Yield

1. INTRODUCTION

Nigella sativa is also known as black cumin, black seed, "kalonji" (in India), "Habbat Al-Barakah" (in the Middle East), "Kalo jeera" (in Bangladesh), "Hak Jung Chou" (in China), Roman coriander, nutmeg flower, black caraway, and fennel flower. It is a member of the Ranunculaceae family (Solmaz Mohammed et al., 2017). Since ancient times, *N. sativa* extracts and oil have been utilized to treat a variety of ailments and other medical issues. *N. sativa* extract has been employed in traditional medicine systems such as Islamic, Unani, Ayurveda, Arabic, and Siddha. The therapeutic efficacy of *N. sativa* essential oil and seeds was well known among the Romans, Greeks, and ancient Egyptians. *N. sativa* is used to make Majdouli or Majdouleh, a braided string cheese, and Armenian string cheese. *N. sativa* is listed as a natural drug in a variety of remedies (Haque et al., 2021). The exact location of Nigella's genesis has remained a mystery (Hammond, 2012). Despite this, believe it originated in the Mediterranean. On the origins of black cumin, some academics have presented opposing viewpoints (Sultana et al., 2015; Yarnell and Abascal, 2011). Especially for example, stated that it is indigenous to North Africa, South West Asia, and Southern Europe (Sultana et al., 2015). According to black cumin is native to South and Southwest Asia (Lal, 2018).

The exact date and location of Nigella domestication are unknown, however, the plant had been in the wild for more than 3000 years when it was discovered in King Tutankhamun's tomb (Hammond, 2012). In ancient history, black cumin farming spans at least North Africa, the Middle East, and South Asia, where the seed has been utilized in traditional medicine for centuries or more (Diwakar et al., 2018). Since ancient Egypt's civilizations, black seed has been employed. Although there is no archeological evidence for the early cultivation of black cumin, seeds have been unearthed at several ancient Egyptian sites, including Tutankhamun's tomb (Genuine Black Seed Oil, 2019). Over time, it expands throughout northern Africa, Eastern Asia, and Southern Europe. In recent decades, Black Seed has made its way into Eastern Europe and North America (Kulloli, 2016). The crop spread throughout Europe as an important spice used in the baking of bread and cakes over the centuries (Heiss and Oeggl, 2005). It is commonly consumed in Europe, North Africa, Asia Minor, and the Mediterranean region, but only in Russia, Egypt, Turkey, and France on a small scale (Aftab et al., 2018).

Figure 1: *Flower of Nigella sativa* (Source: Pinterest)

Nigella is an erect annual plant with a more or less branched stem that grows up to 20 to 60 cm tall (Sultana et al., 2015). The roots are straight taproots and the leaves are split (Dubey et al., 2016). The hermaphrodite bloom, which is solitary on the main axis is frequently cross-pollinated (Shariq et al., 2015). The flower's petaloid sepals are pale green in hue when it first blooms. The color changes to pigeon blue after complete flowering (Perveen and Qaiser, 2006). The involucres of bracts are absent from the flower, and the peduncle is tall and erect. In a single whorl of 4 to 6, petaloid sepals are large and oval. Only 10% of blooms are non-fertile on average (Mukherjee et al., 2013). The stamen is divided into three to four whorls, each of which has 32 to 66 stamen. Numerous small seeds are present in the ripe fruit (capsule: 3-7 joined follicles) (Diwakar et al., 2018). The seeds of black cumin are triangular and have a rough surface. (Margout et al., 2013) describe the seed as flat on one side and convex on the other, with tapering curved ends. The seeds have a moderate odor and a bitter taste and are black on the outside and white on the inside (Perveen and Qaiser, 2006). In general, there is significant morphological and physiological variation among different cultivars of black cumin.

Quick Response Code	Access this article online	
	Website: www.trab.org.my	**DOI:** 10.26480/trab.02.2022.47.51

Cite the Article: Prakash Awasthi (2022). Production and Commercialization of Nigella (*Nigella sativa L.*). *Tropical Agrobiodiversity, 3(2): 47-51.*

2. Importance of Nigella

The significance of nigella has a long history in human culture, as it was used as a spice, traditional herbs, and food preservative, as well as enhancing the flavor of bakeries (Karaçil Ermumucu and Şanlıer, 2017). Black cumin seed is a good alternative crop for small landholders because of its local consumption and other benefits, such as oil and oleoresin for medical purposes, export market, crop diversification, revenue generation, and others (Anshiso and Teshome, 2018). Black cumin's historical and traditional usage has been documented in ancient literature and historical documents (Botnick et al., 2012). The medicinal value is one of the most important uses of black cumin. Ancient herbalists referred to it as a "wonder plant," a "universal healer," a "holy herb," and "the herb from heaven" (Aftab et al., 2018).

Which have reported its value as a natural remedy for several illnesses, treating animal and human ailments, effective anti-microbial drugs, and antioxidants, and improving learning and memory ability (Abdallah, 2017). According to black cumin is a useful natural therapy for a variety of ailments (Yimer et al., 2019). Antioxidant, anti-diabetic, antihypertensive, neuroprotective effects, antimicrobial activity (antibacterial, antifungal, antiviral, and antiparasitic), anticancer, and effects on male infertility are among its qualities. Nigella is beneficial to the immunological and respiratory systems, as well as diabetes, breast cancer, dermatological issues, dyspepsia, osmotic balance, and dehydration. Furthermore, the antioxidant activity of the extract, as well as its involvement in activating gastric mucus secretion and increasing total hexose in the stomach mucosa can all contribute to the gastro-protective action of black cumin seed (Paseban et al., 2020).

Despite so many benefits, commercial production and scientific research in the field of nigella are still not satisfactory compared to other crops. Many factors such as lack of government support and proper knowledge to the farmers about its varieties, and cultivation practices are the key that results in low production of the crop. There is a lack of awareness among the people about its benefits, they consume it regularly, but when comes to the turn of cultivation they avoid it. The main reasons behind its avoidance might be the dominance of other vegetable crops among the farmer's society, lack of quality seeds in the market, and improper extension of cultivation practices among the growers through the government sector. This review paper will provide key guidance to farmers and academic personnel who are interested in either cultivation or research on a particular topic.

3. Methodology

This review was conducted utilizing secondary data from various journals like Springers, Elsevier, MDPI, Google Scholar, Research Gate, and technical reports, all of which were shared with the authors. The review was divided into two key sections: Cultural practices and commercialization. Despite the vast number of articles found for each subtopic, few articles were found relevant. The data from those selected articles were used.

4. Environment Requirements

Plant growth and development, physiological growth, the synthesis of active compounds, and the quantity and quality of essential oils that can be generated are all influenced by environmental factors such as climate and soil conditions. Environmental conditions have a stronger impact on medicinal plant output and essential oil than on other plants, in particular. Plants that fall short of a certain threshold of quality, even if they have a great yield, cannot be produced since quality is equally as important as quantity in medicinal and aromatic plants. This plant should only be grown in regions where the local ecologies of the people who live there are compatible with it (Girma et al., 2016). A growth season with rainfall between 120 and 400 millimeters may be sufficient to maximize production. It thrives in temperatures ranging from 0 to 25 degrees Celsius, with 12-14 degrees Celsius being optimum. Nigella needs a warm temperature to develop quickly, and full sun is optimum for bloom formation. It can tolerate moderate shade, but it won't flower as profusely as it would in full sun (Wako, 2021). Despite its modest water requirements, the availability of water throughout the growth season is crucial for the prompt initiation of blooming and seed set in this semi-arid plant (Habtewold et al., 2017). Nigella thrives on healthy, well-drained soil, but it can also thrive in several different environments.

A sandy loam with significant microbiological activity is the optimum soil for growing. This crop thrives in locations with heavy rainfall and sloppy soils, as well as areas with moderate rainfall and flat, well-drained soils. The plant requires a pH range of 7.0 to 7.5. The temperature of nigella germination is particularly important, with a recommended temperature of 23°C. Even in very salinized environments, the seeds can germinate. Because of its salt resistance, black cumin is classified as a halophyte (Alshammari, 2017).

5. Cultural Practices

For the success of any crop, well-organized cultural practices are vital. Cultural practices include all those activities in the field starting from land preparation to the harvesting of the crops. Nigella although a minor spice crop but when is to be grown for good production or in bulk needs a proper practice of cultural operations.

5.1 Land Preparation and Seed Sowing

Ground for Nigella aka black cumin is prepared at least one month before sowing the seed; depending on the soil qualities, the land should be plowed 2-3 times or more. To facilitate the draining of surplus water from the field and to limit favorable conditions for probable illnesses like wilt and damping-off, the beds were created with 120-130 cm spacing (Habtewold et al., 2017). When considering considerations such as when to plant, how to sow, and the seed rate to utilize, the crop is usually directly sown. For areas receiving rain from May to October, a seeding rate of 20 kg per ha and sowing date in August are advised for Nigella. Nigella seed can be sown by disseminating or rowing. Nigella cultivation can also be done in beds or along a ridge. When using the bed seeding method, however, the highest yield is obtained (Mahmood et al., 2012). It's crucial to soak the seed overnight to ensure that it germinates. Nigella seed is often drilled and thinned back to the optimum spacing (Zapotoczny et al., 2019).

5.2 Irrigation

Although Nigella is a low-water-use crop, water availability during the growing season is critical for flower emergence, seed set, and seed output (Ariafar and Forouzandeh, 2017). Irrigating the seeds at the budding stage may improve essential oil, carvone, and thymoquinone content, but not total yield. As a result, full irrigation is critical for increasing nigella seed output (Hadi et al., 2015).

5.3 Manuring

Even though nigella is a low-fertilizer-demanding crop, inadequate fertilization can reduce yields. To produce the best yield, moderate fertilization is necessary. NPK application at rates of 50, 40, 20, and farmyard manure at rates of 10 to 15 tons per ha are crucial to maximizing output (Habtewold et al., 2017). Most useful parameters (plant height, number of primary branches, number of secondary branches, chlorophyll content, dry weight of the plant), yield parameters (number of capsules per plant, number of seeds per capsule, yield per hectare), and quality parameters (1000 seed weight essential oil content) respond to fertilizer application. Once the revealed that using both organic and inorganic sources of nutrients in an integrated manner yielded the maximum yield (Hadi et al., 2015).

5.4 Weed Management

Protection from weeds, illnesses, and insect pests is another key management task in black cumin cultivation (Jibat et al., 2019). Weeding regularly is essential for reducing weed competition and creating a favorable environment for growth and development. Weed can lower production potential by 60-85%. Hand hoeing is advised for about 3-5 weedings every 20 to 25 days (Habtewold et al., 2017). Weeding for 40 days following emergence is a vital stage of weed competition, resulting in a danger of black seed economic loss. Annual weeds are a major problem during the growing season of the black seed, resulting in a significant reduction in grain yield (Seyyedi et al., 2016). *Phalaris minor, Chenopodium album, Vicia sativa, Anagalis arvensis, Solanum nigrum, Oxalis corniculata, Medicago denticulate, Cynodon dactylon, Gnaphalium affine, Polygonum fudax, Polygonum plebijum, Galinsoga ciliate, Stelaria media, Commelina benghalensis, Ageratum Spp* are the major weeds of nigella (Jibat et al., 2019).

5.5 Diseases and Pests

Diseases along with pests are the major factors that hamper the production of the crops. According to (Jibat et al., 2019) diseases like powdery mildew, wilt, blight, and insects like aphid, mites are the major ones that reduce the production by half. Major diseases of nigella are Fusarium wilt, Black Cumin blight (*Alternaria burnsii*), Powdery mildew (Habtewold et al., 2017; Jibat et al., 2019) whereas the major pests are Aphids (*Myzus persicae*), Mites (*Petrobia latens*) (Habtewold et al., 2017).

In order to get a good yield these agents should be controlled in time either by cultural methods or chemical methods.

5.6 Harvesting

From the time the seed is planted, it takes 58 to 62 days for the flower bud to form and 78 to 87 days for the flower to open (Diwakar et al., 2018). Nigella takes approximately 135-150 days to mature. Harvesting takes place before the seed is shattered. When the hue of the capsules turns brown, it indicates maturity (Habtewold et al., 2017). Nigella has a certain maturity type, and it is harvested by uprooting the plant and tying it in bundles.

5.7 Post-Harvest Operations

Post-harvest management is very crucial for any crop as it extends the shelf life of crops. After harvesting the nigella plants, they are dried through the mean of sunlight by hanging upright until the plant gets dried. Once the plants are dried then they are threshed and winnowed manually or with the help of a machine to separate the seeds from impurities (Tesfa et al., 2017). The seeds are then collected and stored in a cool and dried place for future use.

6. Commercialization

Nigella being a spice of numerous benefits is not produced commercially in Nepal. Nepalese society still has narrow mind thoughts while farming, they cultivate only those crops which are supported by the government or which have high market demand and value or by observing other neighboring peoples. As the status of production in the neighboring states of India closer to Nepal is not quite impressive so people of Nepal don't follow the cultivation of Nigella. Government work in technology dissemination is very poor, and people of rural areas are still unaware of its production practices and health benefits. Thus the primary needs that stike here is the flow of information among the people. Different exhibition programs can be run in order to transfer knowledge to people.

7. Conclusion

Despite the importance of nigella, this analysis concludes that there are research gaps for boosting the crop's yield potential, particularly in the areas of nutrition and weed management, disease, and insect pests. As a result, increasing the production of the crop is critical to meet the needs of local customers, the local market, and export demand. From the discussion above, it can be concluded that instead of negligence, if proper production techniques are adopted, nigella has the potential to be one of the most demanding spices shortly.

References

Abdallah, E. M., 2017. Black Seed (Nigella sativa) As Antimicrobial Drug : A Mini-Review. Novel Approaches in Drug Designing and Development, 3(2), Pp. 1–4. https://www.semanticscholar.org/paper/Black-Seed-(-Nigella-sativa-)-As-Antimicrobial-Drug-Abdallah/e500458339f4f8810f7ffd0a0ecfd9d0edb008aa

Aftab, A., Yousaf, Z., Javaid, A., Rabbani, A., and Ahmed, S., 2018. Nigella Sativa L. from traditional to contemporary medicine: A review. International Journal of Biology and Biotechnology, 15(2), Pp. 237–254. https://www.academia.edu/download/60055986/6_nigella_review_Arusa_Formatted20190719-93498-ufzjkr.pdf

Alshammari, A., 2017. Light, Salinity And Temperature Effects On The Seed Germination Of Nigella Sativa L. Global Journal of Biology, Agriculture & Health Sciences, 6(1), Pp.25-31.

Anshiso, D., and Teshome, W., 2018. Economic Value of Black Cumin (Nigella sativa L.) Conservation at Bale Zone of Oromia Region. Ethiopia. American Journal of Business, Economics and Management,6(4), Pp.104-109.http://www.openscienceonline.com/journal/ajbem

Ariafar, S., and Forouzandeh, M., 2017. Evaluation of humic acid application on biochemical composition and yield of black cumin under limited irrigation condition. Bulletin de La Société Royale Des Sciences de Liège, 86, Pp. 13–24. https://doi.org/10.25518/0037-9565.6528

Botnick, I., Xue, W., Bar, E., Ibdah, M., Schwartz, A., Joel, D. M., Lev, E., Fait, A., and Lewinsohn, E., 2012. Distribution of primary and specialized metabolites in Nigella sativa seeds, a spice with vast traditional and historical uses. Molecules, 17(9), Pp. 10159–10177. https://doi.org/10.3390/molecules170910159

Diwakar, Y., Harisha, C., Singh, B., Kakani, R. K., and Saxena, S., 2018. Floral biology and reproductive behaviour of Nigella sativa L. var. Ajmer Nigella-1. Journal of Pharmacognosy and Phytochemistry, SP3,Pp. 53–58.

Dubey, P. N., Singh, B., Mishra, B. K., Kant, K., and Solanki, R. K., 2016. Nigella (Nigella sativa): A high value seed spice with immense medicinal potential. Indian Journal of Agricultural Sciences, 86(8), Pp. 967–979.

Genuine Black Seed Oil., 2019. History: Nigella sativa oil was placed in the tomb of Tutankhamun. Retrieved from https://www.huile-de-nigelle.net/en/history-of-nigella-sativa.html.

Girma, H., Habtewold, K., and Haimanot, M., 2016. Spices research achievements, challenges and future prospects in Ethiopia. Academic Research Journal of Agricultural Science and Research, 4(1), Pp. 9-17.

Habtewold, Kifelew, Demes, Luleseged, T., Bekele, D., Mitiku, H., and Wakjira., 2017. Seed Spices Production Guideline. Pp. 1–36.

Hadi, M., Ghanepasand, F., and Darzi, M., 2015. Evaluation of Biofertilizer and Manure Effects on Quantitative Yield of Nigella sativa L. International Journal of Agricultural and Biosystems Engineering, 9(8), Pp. 890-893.

Hammond, E., 2012. Food giant Nestlé claims to have invented stomach soothing use of habbatal-barakah (Nigella sativa).

Haque, M., Sapna, Singh, R., Nadeem, A., Rasool, S., Wani, J. A., Khan, A., Ashafaq, M., Makeen, H. A., and Zehra, U., 2021. Nigella sativa: A promise for industrial and agricultural economic growth. Black Seeds (Nigella Sativa): Pharmacological and Therapeutic Applications, January, Pp. 439–460. https://doi.org/10.1016/B978-0-12-824462-3.00010-X

Heiss, A. G., and Oeggl, K., 2005. The oldest evidence of Nigella damascena L. (Ranunculaceae) and its possible introduction to central Europe. Vegetation History and Archaeobotany, 14(4), Pp. 562–570. https://doi.org/10.1007/s00334-005-0060-4

Jibat, M., Getachew, W., Getu, A., and Kifelew, H., 2019. Survey and Identification of Major Weeds of Seeds Spice in Ethiopia. Journal of Plant Pathology & Microbiology, 10(3), Pp. 1–4. https://doi.org/10.35248/2157-7471.10.477

Karaçil Ermumucu, M. Ş., and Şanlıer, N., 2017. Black Cumin (Nigella Sativa) And Its Active Component Of Thymoquinone: Effects On Health. Journal of Food and Health Science, 3(4), Pp. 170–183. https://doi.org/10.3153/jfhs17020

Kulloli, S. K., 2016. Spice lndia English. Retrieved from https://www.researchgate.net/publication/303550909

Lal, G., 2018. Scenario, importance and prospects of seed spices: a review. Current Investigations in Agriculture and Current Research, 4(2), Pp. 491-498.

Mahmood, T., Idress, M., Aslam, M., Rehman, H. S., Akram, H. M., Sattar, A., Abbas, S., and Ferdosi, M. F. H., 2012. Growth and Yield Attributes of Black Cumin (Nigellla sativa L.) as Affected by Sowing Dates and Methods. Mycopath, 10(2), Pp.83–86.

Margout, D., Kelly, M. T., Meunier, S., Auinger, D., Pelissier, Y., and Larroque, M., 2013. Morphological, microscopic and chemical comparison between Nigella sativa L. cv (black cumin) and Nigella damascena L. cv. Journal of Food, Agriculture and Environment, 11(1), Pp. 165–171.

Mukherjee, S., Mandal, A., Gupta, S., and Datta, A., 2013. Pollination events in Nigella sativa L.(black cumin). International Journal of Research in Ayurveda and Pharmacy, 4(3), Pp.342-344.

Paseban, M., Niazmand, S., Soukhtanloo, M., and Meibodi, N., 2020. The preventive effect of Nigella sativa seed on gastric ulcer induced by indomethacin in rat. Journal of Herbmed Pharmacology, 12(4), Pp. 12-19.

Perveen, A., and Qaiser, M., 2006. Pollen Flora of Pakistan - L. Ranunculaceae. Pakistan Journal of Botany, 38(3), Pp. 499–509.

Seyyedi, S. M., Rezvani Moghaddam, P., and Nassiri Mahallati, M., 2016. Weed Competition Periods Affect Grain Yield and Nutrient Uptake of Black Seed (Nigella Sativa L.). Horticultural Plant Journal, 2(3), Pp. 172–180. https://doi.org/10.1016/j.hpj.2016.08.005

Shariq, I., Israil, A., Iqbal, A., and Brijesh, P., 2015. Morpho-physiological characterization of seeds and seedlings of Nigella sativa Linn.: Study on Indian germplasm. International Research Journal of Biological Sciences, 4(4), Pp. 38–42.

Solmaz Mohammed, N., Hilal, Ö., and Nurşen, B., 2017. Pharmacological and Toxicological Properties of Eugenol. Turkish Journal of Pharmaceutical Sciences, 14(2), Pp. 201–206.

Sultana, S., Akhtar, N., Iqbal, A., Nazar, H., Rehman, R. U., and Asif, H. M., 2015. Nigella sativa: Monograph. Journal of Pharmacognosy and Phytochemistry, 4(4), Pp.103–106.

Tesfa, T., Bayu, W., Gashaw, A., and Beshir, H., 2017. Spice Production, Marketing, and Utilization in South Wollo, Ethiopia. East African Journal of Sciences, 11(1), Pp. 27–36.

Wako, F. L., 2021. Black cumin (Nigella sativa L .) Production : A Mini Review Black cumin (Nigella sativa L .) Production : A Mini Review. December.

Yarnell, E., and Abascal, K., 2011. Nigella sativa: Holy herb of the middle east. Alternative and Complementary Therapies, 17(2), Pp. 99–105. https://doi.org/10.1089/act.2011.17203

Yimer, E. M., Tuem, K. B., Karim, A., Ur-Rehman, N., and Anwar, F., 2019. Nigella sativa L. (Black Cumin): A Promising Natural Remedy for Wide Range of Illnesses. Evidence-Based Complementary and Alternative Medicine, 2019. https://doi.org/10.1155/2019/1528635

Zapotoczny, P., Żuk-Gołaszewska, K., and Ropelewska, E., 2019. Impact of cultivation methods on properties of black cumin (Nigella sativa l.) seeds. Journal of Central European Agriculture, 20(1), Pp. 353–364. https://doi.org/10.5513/JCEA01/20.1.2262