

Preface:

For starters, it has been a great pleasure for me, as an agricultural guide in a troubled region that has suffered years of war and displacement, to be an influential member of an academic project that targets the most vulnerable - the farmer, who is the safety valve of developed countries. With the years of war in Syria passing its tenth year, the suffering of Syrians has increased, so that more than 90% of them are below the poverty line, according to the United Nations statistics. This issue, combined with the increase in the cost of agricultural production, the absence of government institutions, the weakness in marketing, and the fluctuation in the exchange rate of the local currency, which has experienced a historical collapse, means that we are facing a threat to food security in the region and imminent disaster. Therefore, the Agricultural Voices Podcast came as a bold step on the right path. Before this project, farmers relied on social media to seek consultations and solutions to their problem, especially **audio clips on Whatsapp, which belong primarily to non-specialist people.** **These episodes** are the solution, and I have to thank the Syrian Academy, the University of Sussex, Cara and all the colleagues involved in this project.

Why the black pill?

Before the war, Syrian farmers in the northwestern region of Syria in general and the Sahl al-Rouj area in particular (now the last food basket in the Idlib region) have relied on several crops, notably potatoes, cotton, sugar, corn and vegetables, as well as wheat and barley and legumes such as beans, chickpeas and lentils. But over the past ten years, circumstances have changed, and many irrigation sources that were operational thanks to government support have now been cut off. This interruption coincided with a crazy rise in fuel price and the cost of adopting alternative solutions such as solar power systems, which many farmers cannot purchase. Therefore, farmers have turned to growing seasonal crops that are rain-fed or irrigated and do not need large quantities of water. One of the most prominent of these crops today in northern Syria is the nigella seed. Due to the sensitivity of this crop to many diseases, the most important of which is filariasis, the absence of an agricultural culture among most farmers, lack of knowledge about the agricultural cycle and the high price of selling Nigella seeds, many farmers have resorted to cultivating this crop in a way that is not best suited to the plant.

1- Country of Origin: **What** is the original home of the nigella seed, and what are its favourite cultivation areas?

The nigella seed has several names in Syria and abroad, including black cummin, black caraway and Iris.

It's native to West Asia, where it grows in both wild and cultivated form. It is currently cultivated in most countries, particularly India, Egypt, the Middle East, the Maghreb, Iran and Pakistan.

According to some historians, the nigella seed was found in the tomb of Pharaoh Tutankhamun. It was mentioned in the noble hadith of Aisha - may Allah be pleased with her. The Nigella seed is a winter annual grass grown in temperate zones and some low-atmospheric temperatures. It can withstand dehydration but cannot withstand high humidity, salinity, nor frost. It is easily grown on any soil and favours sunny sites and light soil. It is better cultivated on most types of land of medium non-solid strength with good drainage and ventilation, especially on light yellow, black and newly reclaimed land.

2- Description and importance: What is the location of the Nigella seed in the vegetarian classification, and in short, what are its nutritional, medical, and economic significance?



Plant family: Nigella seed plants belong to the Ranunculaceae family.

Stems: Up to a 30 cm tall, branched.

Leaves: It's simple, serrated, deeply lobed.

Flowers: It contains five blue-to-grey star-shaped petals with white, green-coloured cups tied at the base and separated at the top.

Pollination in the nigella seed: A mixture performed by insects. We emphasise here the need to place beehives in nigella seeds fields by making agreements with beekeepers to benefit from the activity of bees in pollination.

Seeds: A black toothed ripe within a capsule fruit of five chambers, small with a bare surface, an oily-white hollow with an oily-shaped shape resembling an onion seed, a distinctive aromatic odour and a unique flavour.

Food and medical importance:

Nigella seeds contain about 30 - 35% fixed oil, 2 - 5% essential oil, 1% thymoquinone, and 21% protein - 35% fat - 34% carbohydrate. Like many spices, nigella seeds benefit the digestive system. They help reduce stomach pain and convulsions, ease gas and swelling in the abdomen. They have

stimulating properties, increase milk yield for breastfeeding, and are used to treat prostate and colon diseases and diabetes. The pill has been used since ancient times in pancakes for their delicious flavour and as natural preservatives. It is often crushed and mixed with black honey and sesame and taken on the road as a forceful, stimulating and bleeding agent. It helps the user resist cold in the winter, helps the immune system resist viral diseases such as cold and asthma attacks and reduces blood sugar levels. The pond seeds are used individually or mixed with honey or garlic to treat neurological tension. The oil is used externally on the surface of the skin in the treatment of certain skin diseases. The nigella seed is a medicinal plant, and there are warnings to use its products that we would like to highlight quickly:

- When using Nigella seed oil, the properties of other treatments should be taken into account to avoid potential issues.
- Nigella can cause a rash when ingested by the mouth or applied to the skin in large quantities for a long time.
- The use of a pill during pregnancy can significantly cause the uterus to stop contracting.
- Nigella seed reduces blood sugar levels.
- Pill intake should be stopped two weeks before surgery, as before anaesthesia, blood sugar should be normal, and the patient should be healthy.

3- Agricultural cycle: What is the proper agricultural cycle for growing Nigella seed?

The agricultural cycle, crop cycle or crop rotation describes the rotation of different crops on a single plot of land. Agricultural cycles are important elements in increasing production and improving soil fertility. When crops are rotated, the land can recover the elements and minerals present in the soil because of the different material needs of successive crops. As well as this, crops can have different root systems; some have superficial root systems, others have much deeper ones. Crops also differ in their nutrient absorption needs. For example, grain crops can absorb acidic compounds, such as nitrates and sulfates, whilst others can absorb potassium and ammonium. These properties should be taken into account when considering agricultural cycles. Furthermore, each crop has its own growth period, so the agricultural cycle must take into account the appropriate period after the previous crop is harvested to plant the following crop. The following are some questions that the farmer must answer before designing the agricultural cycle:

- ◀ Is there a sufficient amount of time between the previous and the subsequent harvest to prepare the land?

- ◀ Do crops in agricultural cycles serve each other as fertilisers?
- ◀ Does the proposed agricultural cycle preserve the fertility of land?
- ◀ Does the proposed course help resist grass, pests and diseases?
- ◀ Do you think the proposed agricultural cycle is the best way forward?

The following are examples of some agricultural cycles that can be used to grow Nigella seeds into the conditions of northwest Syria:

- ✓ bicrop agricultural cycle: Wheat or barley, tigers or a Nigella seed (poor and unfertile land).
- ✓ Triple agricultural cycle: Wheat or barley, legumes, Nigella seed.

4- Environmental conditions: What are the ecological conditions for the growth and prosperity of the Nigella seed?

Temperature: The pond plants need cold, wet weather to stimulate growth and seed production. They are sown at the onset of winter.

Moisture: The Nigella seed is a medium-water crop and can withstand dehydration, so it is sown in pasture and irrigated.

Light: Nigella seed needs light just like other crops, and it prefers sunny sites, and light is an important factor in increasing production.

Soil: The Nigella seed favours light, medium- and well-drained soil.

Soil acidity: For soil to be suitable for growing Nigella seed and most aromatic crops, such as cumin, eanson and others, the percentage of acidity in the soil must range from 6.0 to 7.0.

5- Date Planted and Amount of Seeds: What is the best date for growing Nigella seed, and what is the best amount of seeds?

Nigella seed cultivation dates vary according to the climate. For example, and in northwest Syria, December is considered the best month for rain-fed irrigation. The best date for Nigella seed cultivation in our region is usually as follows:

- ✓ Rain-fed agriculture: from 25/11 to 15/1 (depending on rainfall).
- ✓ Irrigated agriculture: 15/11 through 15/12.

The rate of seed for the Nigella seed crop ranges from 1.5 -1.75 kg/dunum. In low-fertility land, we use less seed and increase it slightly in degraded land because the cadre is usually produced after

rainfall and gives a thick layer of soil that hinders seed growth. When cultivating aromatic grain crops such as Nigella seed and cumin, it's best to plough the area in summer and thoroughly sanitise. In doing so, you will ensure a high vegetation ratio and prevent waste of the seed.

6- Cultivation method: What are the ways of growing Nigella seed?

Rain-fed agriculture: The Nigella seed is cultivated in the area of northwest Syria in Baala, where the land is prepared in summer for a deep agricultural season and then ploughed twice in autumn, which helps with good hydration, then finishing and then sanding, preferably adding 2-3 m³ m/mL of fertiliser, and 20-25 kg/dNo superphosphate, during the process of soil processing or immediately before farming. It is also better to add 10 kg/DNo agricultural sulfur with the sterilisation of seeds by a fungicide (tobacine or pavestin) at five g/L). Following this, the Nigella seed is then cultivated, leaving 45 cm between agricultural lines. Although the phenomenon of prose (skin cultivation) is widespread due to the high costs of agricultural production, mechanical seed farming is certainly preferable for the following reasons:

- ✓ The provision of a quantity of seed intended for agriculture.
- ✓ The organisation of plant density within an area unit.
- ✓ Homology.
- ✓ Ensuring homogeneity of growth.
- ✓ Harvest facilitation.

We recommend adding a composite fertiliser (NPK) with an average of 10 kg/mL. It's best to mix the fertiliser with the seed in the mechanical seed tank to ensure a uniform distribution of the seeds along the farming lines.

Irrigated agriculture: In irrigated agriculture, it is preferable not to plant Nigella seed on land irrigated by flooding, or at the very least spraying to prevent the growth of weeds and the spread of fungal diseases that thrive in wet conditions. Therefore, drip irrigation is preferable. Drip hoses in the irrigation network are fitted at distances commensurate with the farming distances so that the distance between the irrigation lines is about 80 cm and the distance between the points is about (30 - 40 cm). At the same time, organic and chemical fertilisers are added. Seeds are sown on both sides of the hose 20 cm and are irrigated immediately after planting.

7- Cave, patch, and pitch: When do we do each of the following agricultural processes: lightness, tinkling and pigmentation when growing the Nigella seed crop?

Nigella seeds need about 45 days to be cultivated, and usually after germination, one, two or three plants appear in each hole, so when increasing the plant density above this limit, it is better to perform a reduction to minimise plant density than when the agricultural expert consults.

Important to limit wasted areas of soil in which plants have not yet emerged due to cultivation. Large-scale vacant spaces can be replanted if planting is early, while in the case of late cultivation after 15/1, the opportunity for grazing is lost.

Al-Azeq: (segregation, sedation or clinic): An essential process that involves removing broad and thin weeds. They compete with the Nigella seed yield against the sources of growth. High plants are generally disposed of by spraying them with a specialised herbicide to control fine weeds. In contrast, the broad herbs need to be uprooted by hand. This is called aziguq. The crop is usually cherished twice throughout the growing season as follows:

- The first one: After the vegetation reached 5 cm long (February 15-25).
- The second one: After the vegetation reached 10 cm long (March 15-25).

Note 1: The crop may require a third bolt after the plant reaches 20 centimetres long. It depends on the prevalence of weeds in the field. Often we don't need to do a third bolt in the cultivated land.

8- Fertilisation: What types of fertilisers should be added to the Nigella seed, and when and how to add them?

Nigella seed is not a stressful crop for soil, so its fertilisation program is simple:

Before planting: Preferably add 2-3 m 3/dNM to full decomposition and 20-25 kg/d superphosphate.

As you plant: We recommend adding NPK with 10 kg/d agriculture.

After planting: Nigella seed requires two types of fertilisers after farming:

- ✓ Urea fertiliser at 10 kg/d is added once in mid-March.
- ✓ Foliar fertiliser (high phosphorus with high potash) with organic fertilisers is usually added after spraying with a fungicide to accelerate the return of plants to normal conditions after pesticide shock. It is useful in increasing grain yield and increasing the seed oil content.
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9- Irrigation: What is the date for the Nigella seed crop, and do we really need irrigation in the conditions of northwest Syria?

The Nigella seed is cultivated in Syria as a Baali crop in areas with rainfall above 350 mm/year. Still, there is no doubt that irrigation regulation is increasing production, and we have several ways to irrigate the Nigella seed:

Flood irrigation: One of the old methods in irrigation has two main types: irrigation on the hot and cold. The most critical differences between irrigation on the hot and cold irrigation are as follows:

Cold irrigation: Irrigation in which irrigation water is slow in motion, causing the land to be completely saturated with water. It is preferable to use cold irrigation after planting the seedlings for the first time.

When planting seeds, they should have good cold irrigation to ensure that they germinate. In high temperatures, it has been observed that increasing cold irrigation may result in stemming the growth of the roots.

Irrigation on the Protector: Irrigation in which water circulation is rapid. Once the irrigation water has reached the end of the field, the source of the irrigation water is locked. It is used after growing vegetable seedlings to encourage radical aggregation and avoid mould problems. As well as this, it can be used before or during frosts to reduce damage and increase plant resistance. Irrigation should be used to protect the water in irrigated crop farming periods to keep flowers from falling. Irrigation batches also protect against the spread of root-busting diseases.

When the Nigella seed crop is irrigated by flooding, it follows these stages:

- ◀ After planting: The land is irrigated immediately after planting the seeds.
- ◀ After the germination: Irrigation is performed every 3 - 4 weeks depending on the soil type and atmosphere temperature during the growth period. On newly reclaimed land, the irrigation periods are reduced to 5 - 7 days.

Drip irrigation: Drip irrigation is more efficient than flood irrigation and is one of the best systems used in land-based fertilisation, and is easier to manage. There is less chance for human error; it requires less labour and facilitates the irrigation of large areas quickly while controlling the amount of water added to plants. Drip irrigation of the Nigella seed crop is done according to the following stages:

- ◀ After planting: We irrigate directly after planting the seed for a continuous period of up to 4-6 hours on the first day, then for one hour on the following days until the seeds germinate.
- ◀ Flower phase: Plants are watered as needed once or twice to increase the grain size and oil content within the grain.
- ◀ Bell-forming phase: Plants should be irrigated every 2-3 days.

◀ Harvest phase: Irrigation is forbidden 20 - 25 days before harvest.

10- Integrated management of the most dangerous lesions of Nigella seed: What are the most significant pitfalls of the Nigella seed crop? How can we combat these issues?

Aromatic grains are the particular target of pests, insects, and diseases, the most important of which are:

First: weed: Exotic weeds must be disposed of. This can be done by hand in small areas, whereas natural herbicides can be used in larger areas.

Second: Pests

These affect the crop during the period of growth, most notably:

☒ The Drill and the Rodent Worm:

digger: Infestation occurs immediately after farming. The leather worm spins at the soil surface while the squid lends the stem beneath the soil surface. To combat the pest, we use the 1.5 kg toxic taste + 2 litre water + 0.5 kg sugar + infectious pesticide such as chloropyrus or berthyroid. Distribute the poison between the lines, or insert via a piston down the plant at sunset.

☒ Absorbent piercing insects (manna, oxides, sediment):

Manna and oxidants are plant pests of insects capable of feeding on plant juice and spreading plant diseases because they act as vectors. The most critical differences between manna and oxides are as follows:

Manna or Zayat in the Local Dialect: These insects absorb plant tissue by their piercing mouthparts, usually living in colonies on the lower face of leaves. The length of the aphids insect varies from 4-8 mm and appear in pear form. The colour of the aphids varies from yellow, brown, and red to black. Wings are not present in adult forms, and even if they have wings, they are transparent. Manna has a pair of dorsal pipe-like appendages. Manna secretes a wax material called a honey symposium that attracts fungi that damage the plant.

Jasid: Gladiators, also called leaf dressers, are insects of the Cicidliidae. The insect is about 28 mm long and appears as a wedge. They are typically yellow or green, though some types vary in colour from bright red to white or blue. In addition, the bodies contain a pair of wings.

The main difference between manna and oxides: the presence and absence of wings. Aphids don't have wings in their adult forms, whereas oxides have wings during adulthood.

Sedimentation (thunderfly or corn lice): One of the most widespread insect pests and some of the farmer's most lethal enemies. They affect some 130 species of plants. Sedimentation is fed by a wide range of sources, whether plant or animal, through the piercing of pests and the absorption of their contents. The precipitation insect starts to be active in the spring. Its population declines afterwards because the temperature rises and the atmosphere dries up. The insect needs moisture to lay its eggs and for its larvae to grow. The precipitation insect hides from the sun during the day and comes out during the evening. One of the clearest symptoms of sedimentation is leaves that appear curved and curled upward. Another sign is the presence of silver spots on the bottom surface of the leaves, caused by air entering through the holes made by the insect. It replaces the juicer absorbed by the insect from the cells, which causes the light to reflect on this point and gives the silver colour. Sedimentation weakens plants, delaying their growth and fruitage and making them more susceptible to other pests.

Persistent insect control: Insects such as manna, oxidants and sedimentation are combatted by spraying with specialised pesticides every 15 to 20 days, depending on the degree of infection, provided that the last spray is at least two weeks before the harvest.

☒ **Red Spider:**

One of the most widespread arachnids. The spider lives in colonies, mainly on the bottom surfaces of the leaves. A single colony can contain hundreds of individuals. They cause damage by absorbing the contents of cells from the leaves. Usually, a small number of spiders is not a cause for concern, but large numbers can cause paper damage. First, the damage occurs as light points on the leaves in silver or bronze colour. As the issue worsens, the leaves turn yellow or red and fall off. The damage is often worse when exacerbated by water stress. The micro-sulfur injuries at a rate of 250 gg/10liters of sprayed water between the two sprays within a week.

Third: Diseases

1- Fungal diseases:



☒ Fizarman wilting:

One of the most widespread diseases among aromatic crops, especially Nigella seed and cumin. The disease presents as partial dehydration of the plant, gradual death by complete wilting (paralysis leading to plant death). The primary source of infection is via spore-carrying soils in wet winds.

It combatted by the treatment of seeds with specialised fungicides such as tobrin at a rate of 3 gg / 1 kg seeds. The Arabic gum is used as an adhesive before planting. Then again, a month and a half after planting, the plant should be sprayed with preventative spray. If an infection occurs, spray with a higher concentration, uproot the infected plants, and burn them outside the field.

☒ Meticulous whiteness:

This is not a common disease for the Nigella seed in Syria. The disease infects the leaves, fruits, and gulls. It appears as white or grey flour spots, which distorts the growth of plants and the wilting of leaves. It produces fruit-bearing and immature grains. To prevent this disease, spray microsulfur at the rate of 250 gg / 100 litres of water. If infected, spray twice every 7-10 days, depending on the severity of the infestation. Spraying is stopped at least one month before harvest.

☒ Al-Nawwar Page:

Two sprinklers (250 gg / 100 litres of water), infected with the D-45, will be sprayed between them for 15 days.

☒ Asclerotin mould:

The infected plants are collected and burned outside the field.

☒ Roots:

It combatted by the treatment of grain with fungal disinfectants and bioorganic compounds at a rate of 4 ml per 1kg of seeds.

b. Physiological diseases:

Often, diseases are caused by a lack of nutrition in the soil due to the misuse of fertilisers and pesticides. We need the intervention of the agricultural expert in the area to determine the type of disease or injury.

Fourth: post-harvest pests: after harvest:



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Insects: In particular, beetles. They resist appropriate safe pesticides, as recommended by the Ministry of Agriculture. The pesticide phosphide aluminium is usually used in a gas pill. It is effective in penetrating stocks and eradicating the pest.

☒ animal pests:

Rodents and birds are dangerous because they damage large quantities of crops. They are capable of transmitting epidemics and many viral diseases. Put nets on venting outlets for storehouses and put out poisonous baits.

☒ Mycoplasma:

such as mushrooms and abayas from stored grains. These are avoided by using suitable packaging such as jute or canvas rounds, good ventilation in storehouses, and thorough cleaning after each storage cycle.

11- Harvest and yield: What are the conditions for harvesting the Nigella seed crop, and what is the expected yield?

Fruit in northwestern Syria usually ripens between June 1-15, depending on prevailing weather conditions. The colour of the plants turns yellow, the seeds mature, and they change colour to black. This can be determined by opening the fruit and ensuring that the seeds become black. The optimal timing of the harvest is in the early morning to prevent the seeds from breaking. Harvesting takes place in two ways:

Manual Harvest: The plants are harvested manually using a 10 cm sickle above the soil surface. The crop is then packed into bundles by local farmers and left to dry in the sun. These are then transported to the assembly area so that the seed is mechanically separated.

Mechanical harvesting: A mechanical harvesting system separates seeds from the rest of the plants and fills them in bags to be sifted later by a skilled and experienced harvester.



After harvest, it is necessary to complete the stages of crop marketing as follows:

Screening: Seeds are sifted after harvest in Graybeal to remove any impurities and gravel. They are then packed in clean sacks of canvas, ready for the market or storage. It should be noted that sifted seeds are more expensive than non-sifted seeds.

Storage: After sifting the Nigella seed, it is usually stored in farmers' warehouses, whilst they wait for the best selling price. Therefore, when storing the crop, it is necessary to take into consideration the following:

- ✓ Select a repository that is appropriate in size and area.
- ✓ Arrangement of bags by stacking them.
- ✓ Leave one or more service paths inside the repository, depending on the size of the repository.
- ✓ Leave 1 meter between the stacks and the warehouse roof and between them and the warehouse walls.
- ✓ Leave disinfection tunnels when building stacks to put the disinfection material inside them to allow better pesticide penetration.
- ✓ Tighten the closure of the warehouse when the warehouse is completely sterilised or cover the stacks with sterilisation protocols tightly after the sterilisation material is placed in the tunnels.
- ✓ The stacks are periodically inspected each month to ensure the crop is safe.

Yield: The yield is divided into two parts: the principal yield (Nigella seeds seed) + the secondary yield (hay).

- ◀ Principal yield: The grain yield where one dunam of 90-150 kg is produced with perfectly mature dry seeds depends on planting time, service operations, and environmental conditions.
- ◀ Secondary language: Often, there is a problem, as Syrian farmers wish to collect straw, but there are some weeds in the field. Harvesters, therefore, apologise for taking straw from the ground

for fear of harvesting these weeds. Therefore, some farmers resort to spraying the field with a generic pesticide three days before harvest. If the field is clean, the vegetation density is high, and the plants are long (in this case, the field is called "Iqbal", the dense agriculture), the harvesters accept the extraction of straw and grain yield during harvesting. Without Nigella seeds, they usually produce between 75-100 kg of straw.