



နှမ်းသီးနှံစိုက်ပျိုးရန်သင့်တော်သည့်

မြေအမျိုးအစား နှင့် မြေဩဇာအသုံးပြုမှုနှုန်းထားများ



မြေအသုံးချရေးဌာနခွဲ
စိုက်ပျိုးရေးဦးစီးဌာန

(၂၀၂၂ ခုနှစ်၊ နိုဝင်ဘာလ ၂၂ ရက်)





Introduction

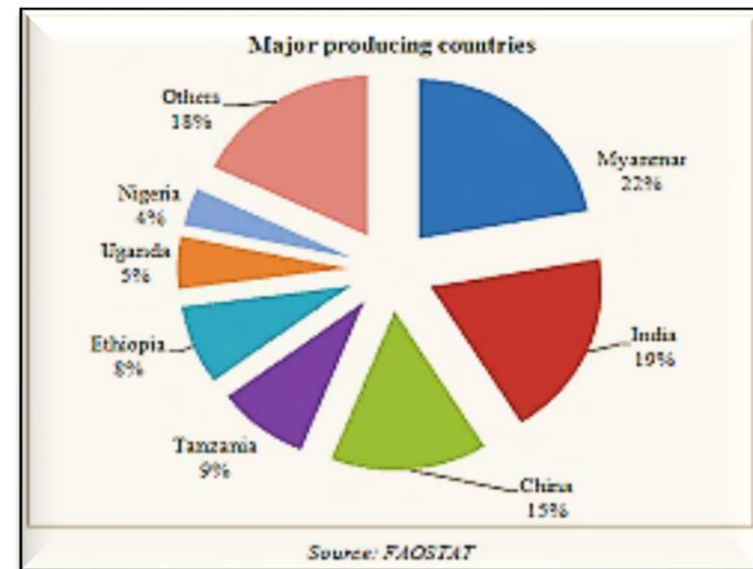
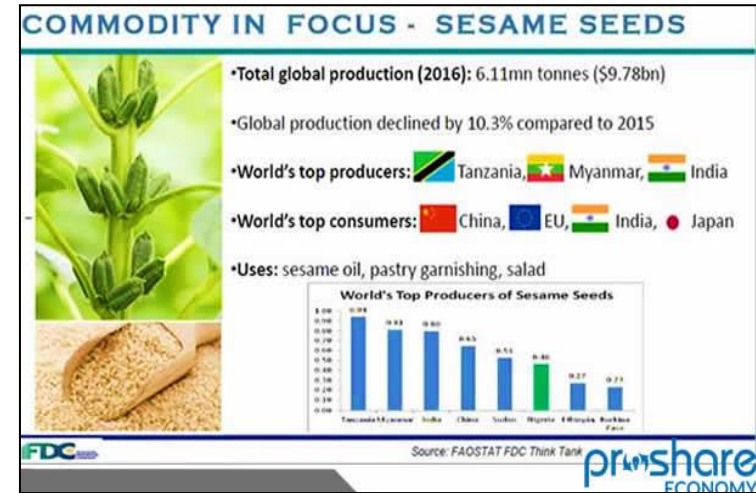


Sesame (*Sesamum indicum* L.; Family: Pedaliaceae) is a flowering plant in the genus *Sesamum*. Sesame seed is one of the oldest oil seed crops known, domesticated well over (3000) years ago.

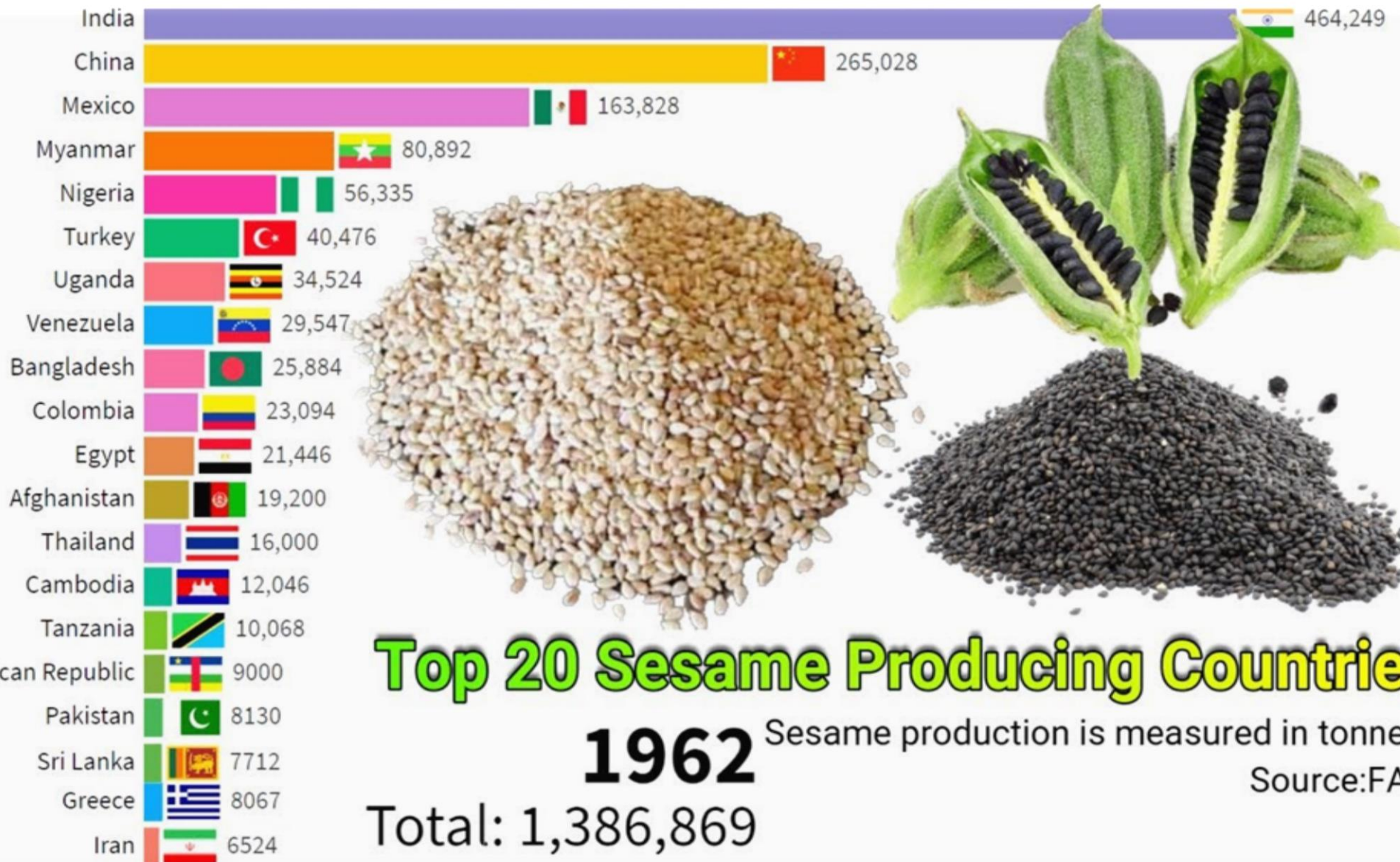
Sesame is drought-tolerant and is able to grow where other crops fail. Sesame has one of the highest oil contents of any seed. The world harvested about (3.84) million metric tons of sesame seeds in 2010.

The local tropical and sub-tropical regions of Asia, Africa, South production of sesame is very low and does not cover the and North America

The largest producer of sesame seeds in 2010 was Burma. The world's largest exporter of sesame seeds was India, and Japan the largest importer.



Top 20 Sesame producing Countries in the world (1962)



Top 20 Sesame Producing Countries

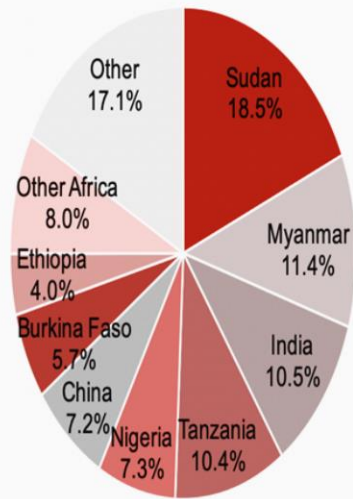
1962

Sesame production is measured in tonnes.

Source:FAO

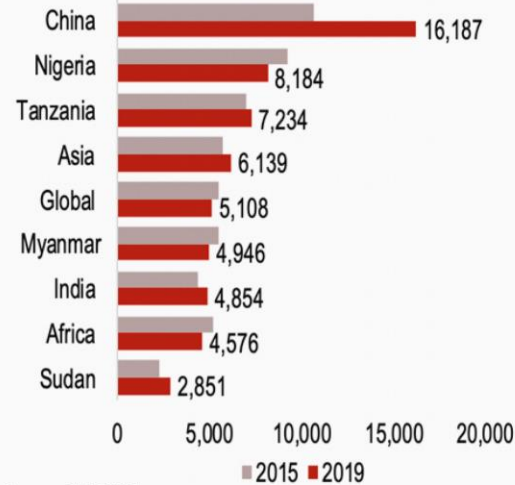
Total: 1,386,869

Figure 3: Global Sesame Seed Production 2020

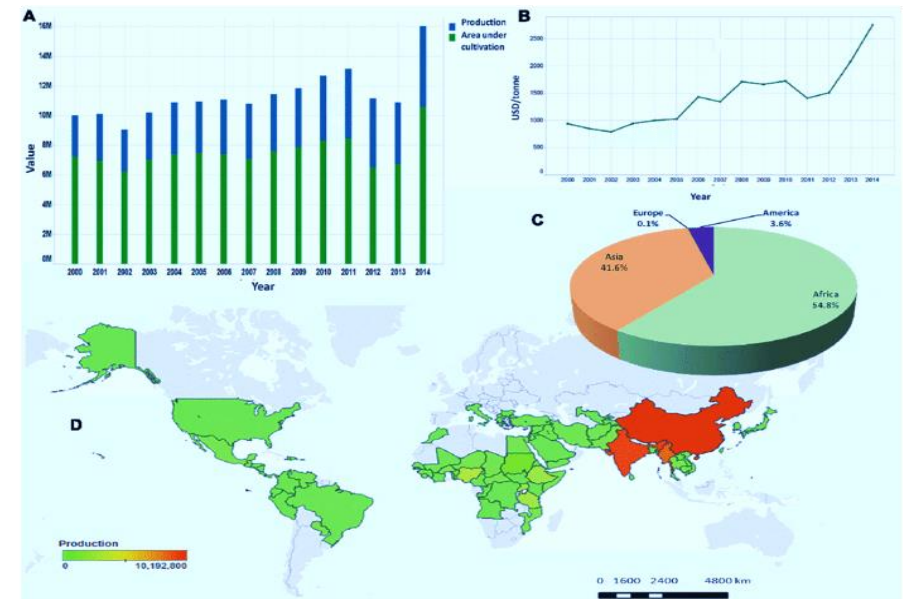


Source: FAOSTAT

Figure 4: Sesame Seed Yield



Source: FAOSTAT

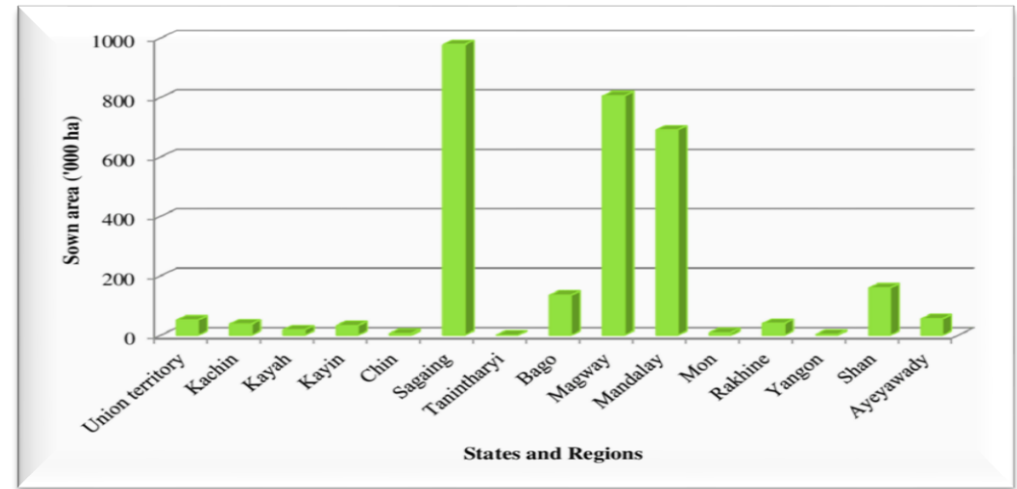
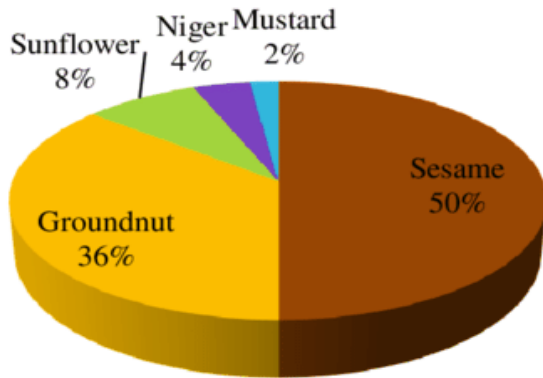


Sesame seed production – 2020

Country	Production (tonnes)
Sudan	1,525,104
Myanmar	740,000
Tanzania	710,000
India	658,000
Nigeria	490,000
Global	6,803,824

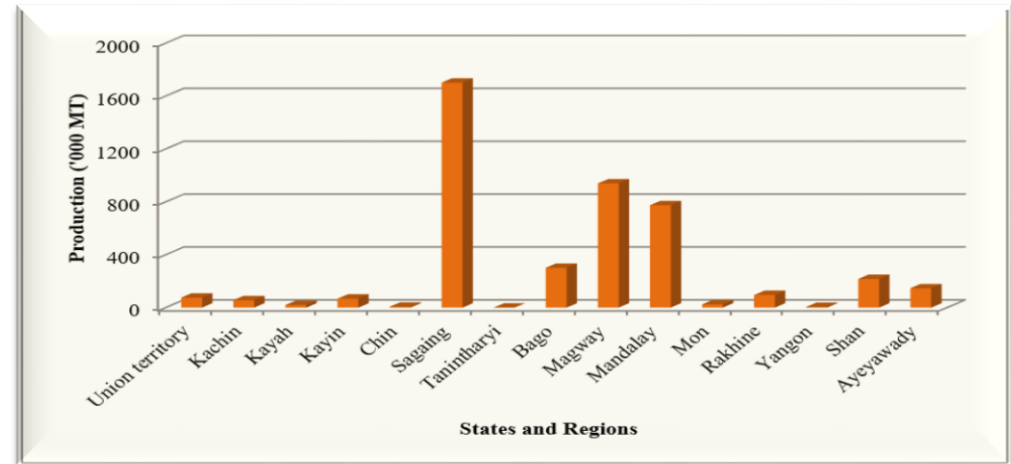
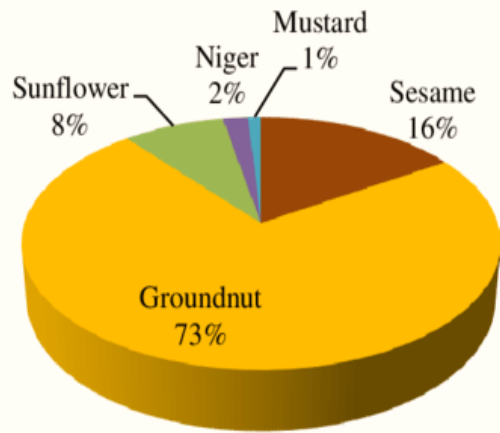
- Sesame seed production in the world.
- (A) Evolution of sesame seed production and area under cultivation from 2000 to 2014.
 - (B) Evolution of sale prices of sesame seed from 2000 to 2014.
 - (C) Production share of sesame seed by continent in 2014.
 - (D) Map of production quantities of sesame seed by country based on cumulative data from 2000 to 2014.
- (Source: Food and Agriculture Organization Statistical Databases [FAOSTAT], 2015).

Production for Major Oilseed Crops in Myanmar (2019-2020)



Percentage shares of **sown area** for major oilseed crops in Myanmar (2019-2020).

Sown areas of oilseed crops in different States and Regions of Myanmar (2019-2020).



Percentage shares of **production** for major oilseed crops in Myanmar (2019-2020).

Oilseed crops production in different States and Regions of Myanmar (2019-2020)

Source: DOA, 2020



Sesame production in the world



Myanmar– Myanmar is the leading sesame seeds producer in the world and produces (18.3%) of the total sesame seeds produced on an annual basis. As far as the exact numbers are concerned, Myanmar produces (890,000 metric tons) of these seeds every year.

India– is also one of the leading exporters of sesame seeds. The country’s tropical climate and large scaled crop area make it possible for it to produce (626,000 metric tons) of sesame seeds every year. This amount is about (13.1%)of the total produce of these seeds on an annual basis.

China –is the top 5 sesame seed producers in the world. The country produces (12.8%) of the total sesame seed amount and this amounts to (623,492 metric tons).

Sudan–is among the top sesame seeds producers and exporters in the world. The country produces (562,000 metric tons) of sesame in the world which is about (11.5%) of the world’s production.

Tanzania– The 5th largest producer of sesame seeds in the world is Tanzania. This country produces close to (8.6%)of the total sesame seeds produced by the world and this amount to about (420,000 metric tons).

The top five sesame seeds producers produce about (70%) of the total amount. Some of the other countries which too produce considerable amounts of sesame include Uganda, Nigeria, Bangladesh, Pakistan, Mexico and Thailand.

The global sesame exports are estimated to be about 5 to 6 lakh tons wherein India, China and Mexico are the leading sesame seeds producers & suppliers.



Sesame plant description:



- ♣ It is an annual plant growing 50 to 100 cm (1.6 to 3.3 ft) tall, with opposite leaves 4 to 14 cm (1.6 to 5.5 in) long with an entire margin; they are broad lanceolate, to 5 cm (2 in) broad, at the base of the plant, narrowing to just 1 cm (0.4 in) broad on the flowering stem.
- ♣ The flowers are tubular, 3 to 5 cm (1.2 to 2.0 in) long, with a four-lobed mouth.
- ♣ The flowers may vary in color with some being white, blue or purple.
- ♣ Sesame fruit is a capsule, normally pubescent, rectangular in section and typically grooved with a short triangular beak.



Pink flowering sesame produces black seed. This is actually *Sesamum radiatum*.



White flowering sesame produces white seed. The botanical name for this is *Sesamum indicum*.

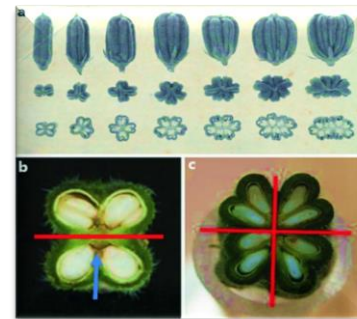
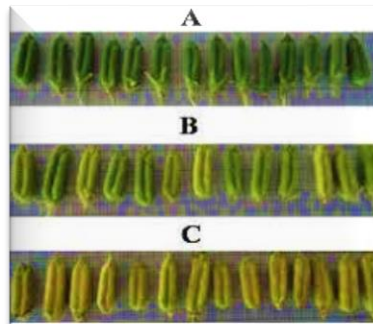
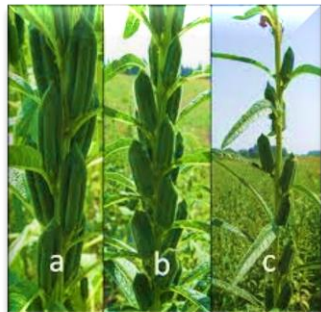


KKMU- LUD, DOA ?

Sesame plant description (Cont.,)



- ❖ The length of the fruit capsule varies from 2 to 8 cm, its width varies between 0.5 to 2 cm, and the number of locule from 4 to 12. The fruit naturally splits open (dehisces) to release the seeds by splitting along the septa from top to bottom or by means of two apical pores, depending on the varietal cultivar.
- ❖ The degree of dehiscence is of importance in breeding for mechanized harvesting as is the insertion height of the first capsule.
- ❖ Capsule dehisces (open) by splitting along septa from top to bottom. Lower capsules ripen first and those nearest the tip last.
- ❖ Physiological maturity normally occurs 95-110 days after planting for early types and up to 150 days for late types.
- ❖ Physiological maturity is when 75% of the capsules on the main stem have mature seeds or when three-fourth of the stem turns yellow.
- ❖ Sesame normally dries down in about 150 days.
- ❖ The white and other lighter-colored sesame seeds are common in Europe, the Americas, West Asia, and the Indian subcontinent.
- ❖ The black and darker-colored sesame seeds are mostly produced in China and Southeast Asia.





Climatic Requirement of Sesame



- ♣ It can be cultivated up to the latitude of 1600 m (India 1200 m).
- ♣ Sesame plant needs fairly high temperature during its life cycle.
- ♣ Normally the optimum temperature required during its life cycle is **between 25 - 35° C**.
- ♣ If the temperature is more than 40° C with hot winds the oil content reduces.
- ♣ Sesame (*Sesamum indicum*) is grown in areas with annual rainfall of 625-1100 mm and temperature of >27° C.
- ♣ The crop is tolerant to drought, but not to water logging and excessive rainfall.
- ♣ Sesame is well adapted to a wide range of soils, but requires deep, well-drained, fertile sandy loams.
- ♣ Number of capsules per plant is directly related to number of flowers but climatic conditions can affect the percentage of fertilized flowers.
- ♣ Plant population also directly influences the number of capsules per plant, high population or close spacing in the row tends to reduce both the number of capsules and number of seeds per capsule.



Climatic Requirement of Sesame



Commercial Sesame cultivation is a very good business and you will make good profit if you follow this complete guide carefully.

Pick A Good Location

Sesame seeds require a location with well-drained soil which is fertile with neutral pH and full sun for proper growth and maximum yield.

Soil Preparation

The ideal pH level for growing sesame plants is between 5.5 and 8.0. Acidic or alkaline soils are not suitable for growing sesame.

Variety Selection and Purchase

There are several sesame varieties available in different parts of the world. It is best to select the variety which is easily available in your area. Ensure to purchase good quality seeds from any nearest markets or order online.

Planting and Planting Rates

Because the sesame seeds are very small in size, you will require less seeds as compared to other crops. Generally, a proportion of 2- 2.2 kg seeds will be enough for one acre and ensure to plant them in rows.

Harvest and Yield

Sesame seeds become ready for harvesting within 3-5 months after planting the seeds depending on the variety. It is possible to expect between 200 and 500 kg per hectare in autumn. And 300-600 kg per hectare in summer.

Pest and Diseases

The common pests you will notice while growing sesame plants are the caterpillar and gall fly. Endeavour to consult with an experienced farmer for the best control measures.

Fertility, Water and Weed Management

Ensure to use balanced NPK fertilizers, apply fast light irrigations after a heavy pre- irrigation for moisture and consistently take out weeds within a period of 15- 20 days from the previous weeding.





Temperature Requirement



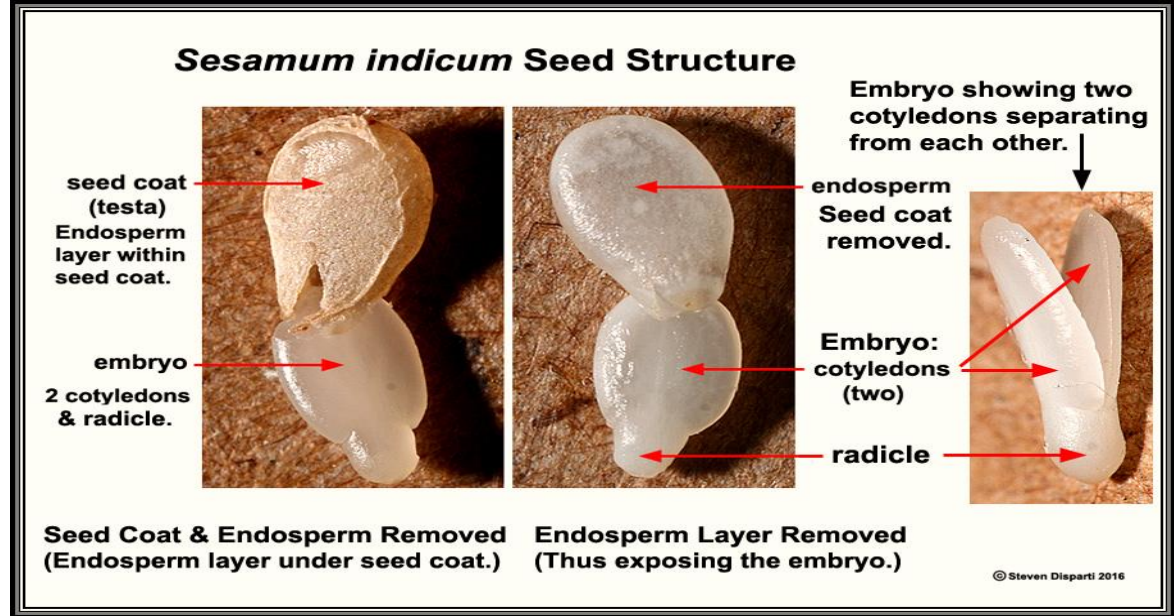
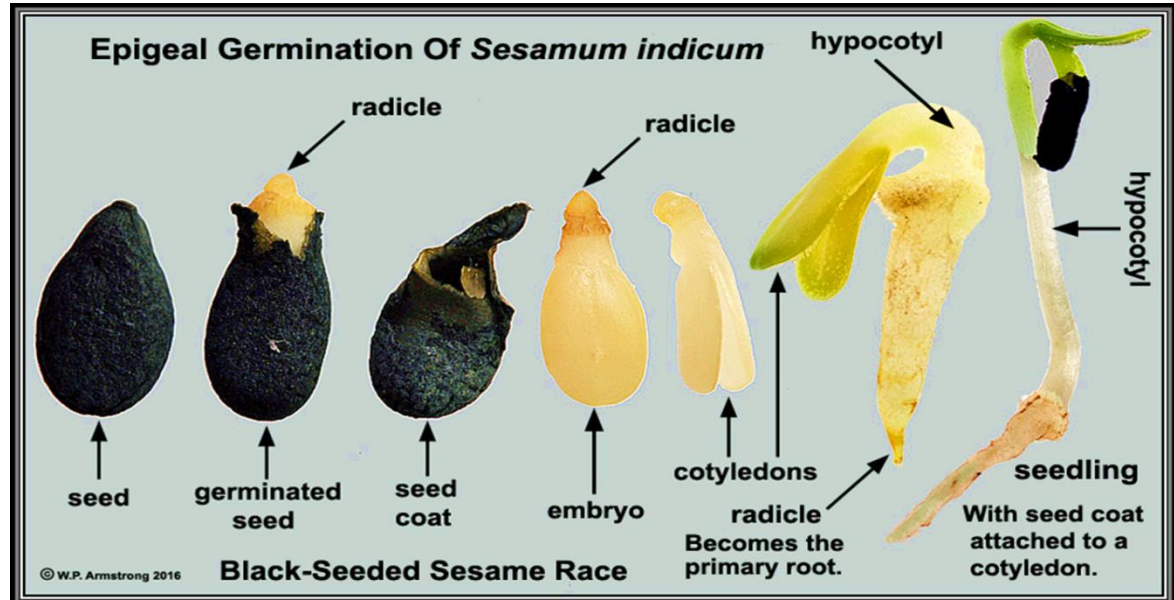
- ♣ Sesame requires hot conditions during growth to produce maximum yields.
- ♣ For optimum development and yield, sesame requires 25 to 37°C temperature throughout its growth period.
- ♣ A temperature of 25 to 27°C encourages rapid germination, initial growth, and flower formation.
- ♣ Temperature below 20°C for any length of time inhibits germination or delay, and a temperature of less than 18°C after emergence will severely retard growth of seedlings.
- ♣ The seeds will not germinate at all at temperature below 11°C. Low temperature at flowering can result in the production of sterile pollen, or premature flower fall.
- ♣ Conversely, period of high temperatures, 40°C or over, at flowering will seriously affect fertilization and the number of capsule set will be low.
- ♣ Thus, do not plant sesame in areas with frost history or low night temperatures.



အပူချိန်လိုအပ်ချက်



နှမ်းစေ့အပင်ပေါက်ရန်မနက်ခင်းပိုင်းမြေဆီလွှာ အပူချိန်အနည်းဆုံး (မြေမျက်နှာပြင်အောက် ၁ လက်မ အနက်တွင်) ၂၀ ဒီဂရီစင်တီဂရိတ် ရှိဖို့လိုအပ်။ နှမ်းပင်သက်တမ်းတလျှောက် ညပိုင်း အပူချိန်ဟာ ၄ ဒီဂရီစင်တီဂရိတ် အောက် ကျနေမယ်ဆိုရင် အထွက်နှုန်း မကောင်းနိုင်ပါ။ အကောင်းဆုံးပါ။ အပူချိန် ၂၀ ဒီဂရီစင်တီဂရိတ် မှာ အပင်ကောင်းစွာပေါက်နိုင်ပြီး ၂၀ ဒီဂရီ စင်တီဂရိတ်အောက်ဆိုရင်တော့ မျိုးစေ့တွေ အပင်မပေါက်နိုင်ပါဘူး။ အပူချိန် ၂၅ ဒီဂရီ စင်တီဂရိတ်အထက် မှာ အပင်ကြီးထွားနိုင်ပြီး အပွင့်ပွင့်ရန် အသင့်တော်ဆုံး အပူချိန်ကတော့ ၂၄ ကနေ ၂၇ ဒီဂရီစင်တီဂရိတ်ဖြစ်ပါတယ်။ အပူချိန် ၄၀ ဒီဂရီစင်တီဂရိတ် အထက် ဆိုရင်တော့ သန္ဓေအောင်မှုထိခိုက်ပြီး အသီးတင် မှု နည်းစေ ပါတယ်။





Soil is Suitable for Sesame



Soil preference

Sesame is adapted to fertile, well-drained soils and is not salt tolerant. Medium textured soils are most favorable. Sesame prefers neutral to slightly alkaline pH, with moderate fertility. Sesame does not like heavy clay soils or irrigation water containing high concentrations of salt. Soil. Sesame can be grown on a wide range of soils but well drained light to medium textured soils are preferred. The optimum pH range is 5.5 to 8.0, acidic or alkaline soils are not suitable.

မြေအခြေအနေ

နှမ်းဟာ အတော်အတန်စေးသောမြေနဲ့ ဖွယ်တဲ့မြေတွေ၊ ရေဆင်းကောင်းတဲ့မြေမှာ ကောင်းစွာဖြစ်ထွန်းသည်။ မြေစေးတွေမှာဆို ဘောင်အမြင့်နဲ့ ရေပါးပါးသွင်းဖို့လိုပြီး ရေဆင်းကောင်းအောင် ဆောင်ရွက်ရပါမယ်။ ဝါပင်လောက်တော့ မြေငံဒဏ်ကို မခံနိုင်ပါ။ နုန်းမြေ၊ သဲနုန်းမြေ၊ နုန်းစနယ်မြေနဲ့ မြေနီသဲဝန်း မြေများမှာ စိုက်နိုင်ပါတယ်။ မြေချဉ်ငံဓါတ် ၅.၈-၇ အတွင်းရှိတဲ့ မြေများကတော့ အကောင်းဆုံးပါ။





Sesame Crop Irrigation



- ♣ Usually the crop is grown under rainfed conditions. When facilities are available, the crop may be irrigated to field capacity after thinning operation and thereafter at 15-20 days interval.
- ♣ Stop irrigation just before the pods begin to mature. Surface irrigation at 3 cm depth during the critical stages, 4-5 leaves, branching, flowering and pod formation will increase the yield by 35-52 per cent.
- ♣ Two irrigations of 3 cm depth each in the vegetative phase (4-5 leaf stage or branching) and in reproductive phase (at flowering or pod formation) are the best, registering maximum yield and water use efficiency.
- ♣ In the case of single irrigation, it **can be best given in the reproductive phase**.
- ♣ In the tail end fields in command area, best use of the sparingly available water can be made for augmenting sesame production.

Interculture: The crop is very sensitive to weed competition during the first 20-25 days. Two weeding, one after 15-20 days of sowing and other at 30-35 days after sowing are required to keep the field weed free and to make moisture and nutrients available to the crop. When the plants are about 15 cm in height, thin the crop so as to give a spacing of 15-25 cm between plants.



Role of Organic Matter in Soil Fertility



Organic matter forms a very small but an important portion and it is obtained from dead plant roots, crop residues, various organic manures like farmyard manure, compost and green manure, fungi, bacteria, worms and insects.

Functions of organic matter

Organic matter improves the physical condition of the soil, particularly the structure.

1. Decaying organic matter acts as a food material for bacteria, fungi and other organisms.
2. Presence of organic matter dissolves many insoluble soil minerals and make them available to plants
3. It plays an important role in the nutrient supplying power of soil as it has got high cation exchange capacity (CEC)
4. It increases the water holding capacity of the soil, particularly in sandy soils.
5. It improves aeration and infiltration in heavy soils.
6. It reduces loss of soil by water and wind erosion
7. It regulate soil temperature
8. It serves as an important source of certain plant of food element (N, P, S etc).
9. The buffering nature of the organic matter is considered to be advantageous in the residue management of pesticides, herbicide and other heavy metals.



General fertilizer recommendations



Sesame does not require much fertilizer except where the soil is very poor. The recommended rate of **50 kg N / ha + 60 kg P₂O₅ /ha + 35 K₂O kg/ha** is required. 3 bags of NPK fertilizer (15:15:15) should be applied at planting and 2 bags of Urea should be applied at juvenile stage.

Crop is relatively drought-tolerant and is often grown where water supply is limited. In these circumstances, plant density should not exceed 250,000 /ha. Many varieties are available; local varieties are often relatively unresponsive to higher rates of fertilizer.

General fertilizer recommendations: 90kg/ha N and, where P is needed, up to 90 kg/ha P₂O₅.

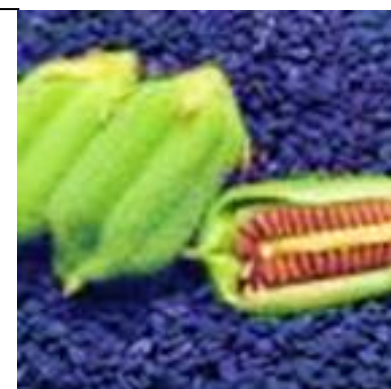
Responses to N in the range of 7-10 kg seed per kg N applied have been reported, depending on inherent soil fertility and rate of N applied.

Over 1 t/ha seed has been obtained in India with a fertilizer application of 60 kg/ha N, 40 kg/ha P₂O₅ and 24 kg/ha K₂O.

(IFA, World Fertilizer Use Manual (1992))

Dose and method of application of fertilizers in sesame field

Fertilizers and manures	Dose/ha	Application (%)		
		Basal	15 DAS	30 DAS
Cowdung	10 tonnes	100	--	--
Urea	As per treatment	--	50	50
TSP	150 kg	100	--	--
MoP	50 kg	50	25	25
Zinc Sulphate	5 kg	100	--	--
Sulfur	10 kg	100	--	--
Boron	As per treatment	100	--	--





Nitrogen Management



- ❖ Nitrogen is a structural component of chlorophyll and protein. An adequate supply of nitrogen is beneficial for both carbohydrates and protein metabolism as it promotes cell division and cell enlargement, resulting in more leaf area and thus ensuring good seed and dry matter yield. A suitable supply of nitrogen is essential for vegetative growth and desirable yield. Excessive application of nitrogen is not economical and it prolongs the growing period and delays crop maturity. Excessive nitrogen application also causes physiological disorder.
- ❖ The initial symptoms will be pale green to light green color change on leaves. The color change normally starts from the leaf tip of older leaves. Depending on the severity of deficiency, the death and dropping of the older leaves happen. The affected plants will show stunted growth.
- ❖ Add organic matter to the soil at the time of planting. Treat the planting materials with bio fertilizers like Azospirillum etc. Check whether the recommended quantity of fertilizers is applied in time.
- ❖ Go for soil analysis and understand the extent of deficiency. Apply quick release nitrogen fertilizers like urea as per soil test result in split doses.
- ❖ As an immediate solution applies urea as foliar spray (10 gram /liter of water) once in 15 days till the deficiency is over. Application of organic growth promoters at frequent interval is also advantageous.





Phosphorus



Deficiency Symptoms

Branching suppressed, stalks slender, lower leaves dull dark, grayish green. The deficiency symptoms will be first noticed in older and lower leaves. Necrosis of lower of majority of leaves is followed by defoliation.

Correction Measure

Soil application of single super phosphate 2% DAP foliar spray at fortnightly intervals.

Management

Phosphorus is best absorbed by the roots in the pH range 6.5-7.5. So adjust pH in acidic soils by adding lime/ dolomite. Add bio fertilizers containing phosphorous solubilizing bacteria along with organic manure to increase phosphorous availability. Check whether the recommended quantity of fertilizers is applied in time.

An excess of Iron and Zinc may also cause the symptoms of phosphorus deficiency. Go for soil analysis and understand the extent of deficiency. Apply fertilizers such as single superphosphate for immediate correction or bone meal or rock phosphate for long term correction as per the soil test report.(<http://farmextensionmanager.com/sesame-deficiency>)



Potassium



Deficiency Symptom

Potassium is a highly mobile element in plant. The deficiency symptoms will be first noticed in older and lower leaves. The symptom starts as white, yellow, or orange chlorotic spots or stripes on older leaves starting from the leaf tips and margins. This is followed by browning and necrosis of leaf margins. The symptoms will be expressed more in the flowering and maturity phase.

Management

Optimum availability of potassium is at soil pH above 6.0. So correct soil pH in acidic soils by adding lime/ dolomite. Add organic matter and wood ash to the soil. Add bio fertilizers containing potash mobilizing bacteria to release non exchangeable potassium from soil. Check whether the recommended quantity of potash fertilizer is applied in time. Sesame requires high concentration of K in the tissue, between 1.5% to 2.4%, and low K in the soil can cause poor growth.

Go for soil analysis and understand the extent of deficiency. Apply Muriate of Potash (MOP) as per soil test report. Split application is more beneficial. As an immediate solution apply Sulphate of Potash (SOP) as foliar spray (10 gm /liter of water) during morning hours along with wetting agents.



Calcium



Deficiency Symptoms

Calcium is an immobile element in plant. Hence, calcium deficiency is seen mainly in growing points, younger leaves and developing fruits. The internodes become shorter and leaf becomes leathery and brittle. Terminal bud dies out following distortion of the tips and bases of young leaves. Hooking downward of the young leaf tips followed by twisting and puckering can be noticed. The plant shows stunted growth. High incidence of pest and disease is also seen in such plants.



Correction Measure

Soil application of gypsum @ 50 kg/ha.

Management

Check the pH of the soil. If the soil is extremely acidic (pH between 3.5 and 4.5), apply lime (3.4 kg/cent of 40 m² in two split doses). And in areas of moderate acidity (pH between 5.5 and 6), apply lime (1 kg/cent of 40 m²). Dolomite can be used as cheap substitute of lime.

High levels of phosphorous can also induce calcium deficiency. In alkaline soil go for application of Gypsum. Calcium has little mobility in the plant; its availability has to be ensured all the time. Boron is needed for calcium utilization. A boron deficiency can also lead to calcium deficiency.



Magnesium



Deficiency Symptoms

The symptoms of magnesium deficiency are seen first in the bottom leaves. Lower leaves develop interveinal chlorosis, light yellow in color becoming orange later. Green color persists in midrib and veins giving a characteristic pattern.

Correction Measure

Foliar spray of 2% MgSO_4 at fortnightly intervals

Management

Go for soil analysis and confirm the deficiency. Apply Magnesium sulphate (320 gram /cent or 32 kg/ acre) in bands near plants.

Application of dolomite will also reduce magnesium deficiency in long run. However, magnesium and potassium fertilizers should not be used together.



Sulphur



Deficiency Symptoms

- Sulphur deficiency produce smaller new leaflets with yellow and erect petioles than the normal. Plants are smaller in size and modulation is poor. Sulfur is a relatively immobile element in plants. So deficiency symptoms first appear in the upper and younger leaves. The symptoms are chlorosis followed by general yellowing. The growth of the plant is retarded. Leaf size is reduced.
- Initially, the fully emerged young leaves turn pale. Later, turns golden yellow. On individual leaves, paling starts from the distal part and spreads to the base of the lamina. If severe deficiency continues, the young leaves shed prematurely. The number and size of flowers are reduced. Under severe deficiency flowers shed prematurely causing loss of pod yield. Plants are smaller in size and nodulation is poor.

Correction Measure

- Foliar spray 0.5 - 1% of calcium sulphate



Management

Apply organic matter to increase sulphur availability. Avoid burning of organic wastes. Application of fertilizers like Factamfos, Ammonium sulphate, Single superphosphate etc. that contain sulphur reduces the deficiency.

Go for soil analysis and identify the extent of deficiency. In deficient soils, apply Sulfur dust (100 gram /cent or 10 kg/ acre) in the soil. The application of gypsum will also correct the deficiency in alkaline soil.



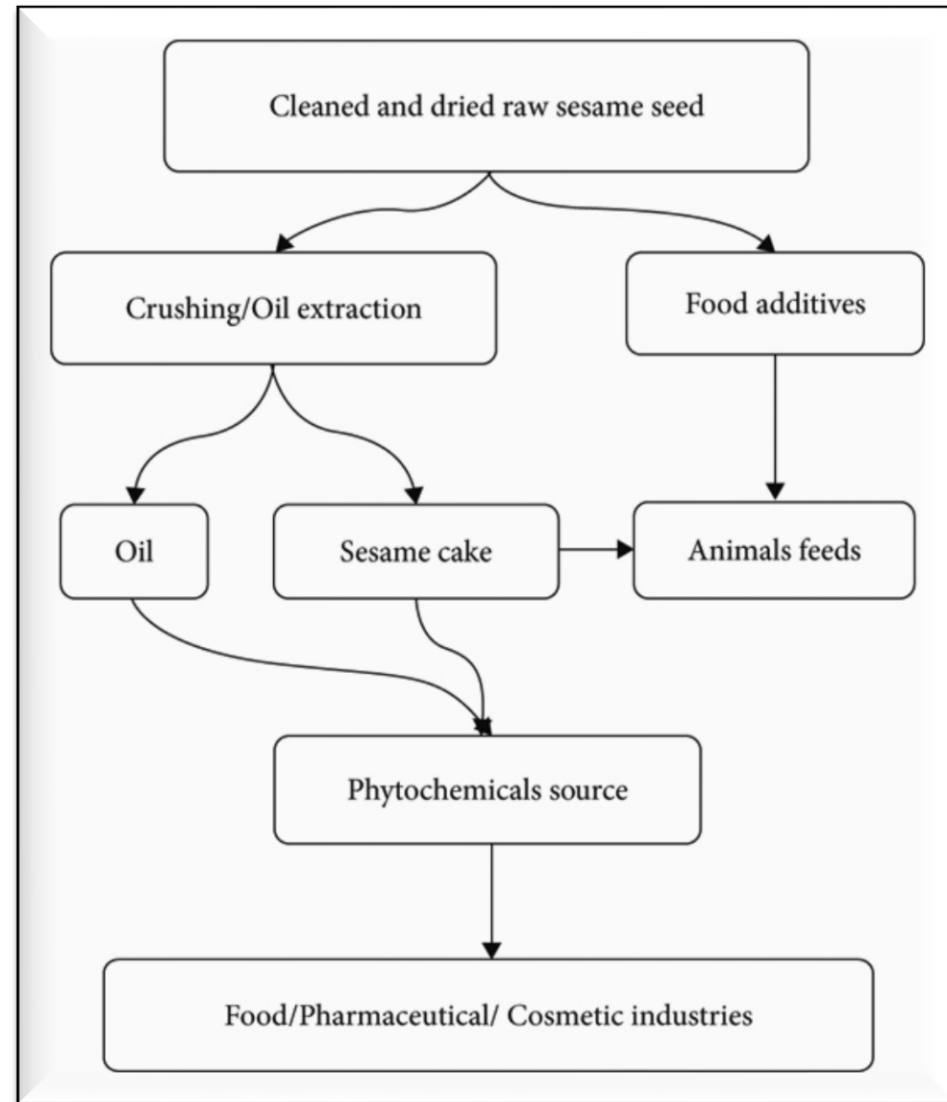
Sulphur and Oil Seed



S is considered as the fourth main plant nutrient after nitrogen (N), phosphorus (P) and potassium (K), and its low availability in various soils causes the innate S deficiency.

High yield and quality of oilseed crops are possible only when crops grown with optimum amount of S in the growth medium because S plays a key role in the plant metabolism, indispensable for the synthesis of essential oils, chlorophyll formation, cell development and it also increases cold resistance and drought hardiness of crops especially for oilseed crops.

In general, sufficient amount of S application significantly increases crop growth and improves the quality of sesame by increasing protein and oil contents.





Boron and Plant Growth



- ♣ Boron is one of the essential micronutrients required for **plant growth and productivity**. It plays a vital role in cell wall synthesis, RNA metabolism, root elongation, phenol metabolism and helpful for pollen and tube growth.
- ♣ Mary et al., observed that foliar application of boron was beneficial to increase the number of pods/branch, the number of seeds/plant and seed yield/plant.
- ♣ Kalyani et al. observed that boron applied as boric acid was increased the plant height, relative growth rate, net assimilation rate and leaf area index.
- ♣ Boron is a micronutrient essential for the **healthy growth of pollen grains, sugar translocation and movement of growth regulators within the plant**.
- ♣ Photosynthetic activity and metabolic activity enhanced with the application of boron.
- ♣ Boron's involvement in **hormone synthesis, translocation, carbohydrate metabolisms and DNA synthesis probably contributed to higher growth and yield**.
- ♣ Deficiency of Boron causes severe reductions in crop yield, due to severe disturbances in B involving metabolic processes, such as **metabolism of nucleic acid, carbohydrate, protein and indole acetic acid, cell wall synthesis, phenol metabolism, membrane integrity and function**.



Boron and Sesame Plant



Deficiency Symptoms

Yellowing of plant tops and of the youngest leaves. Upper leaves became dark green, coriaceous, with edges curved down. inhibits root elongation leading to the death of root tips.

Boron is an immobile element in plant. Hence, boron deficiency is seen mainly in growing points, younger leaves and developing fruits. Yellowing of growing regions and the youngest leaves can be seen.

Correction Measure

Foliar spray Borax 0.2% at fortnightly intervals.

Management

Boron deficiency is seen more in dry soils. High available phosphorous in soil also hinders boron absorption. Go for soil analysis and confirm the deficiency. Apply Borax (40 gram /cent or 4 kg/ acre) into the soil. For immediate result spray Borax (1 gram / liter of water) as foliar spray. Excess concentration may result in toxicity.

If calcium and boron have to apply simultaneously, apply calcium in soil and boron as foliar spray. Foliar spraying should be done during morning hours. The best stage of application is just before flowering. Similarly, borax should not be applied with ammonium fertilizers.



Iron



Deficiency Symptoms

The symptoms will be yellow leaves with dark green veins (interveinal chlorosis) with eventual bleaching of the new growth. When severe, the entire plant may be light green in color.

Decrease the dry weight of leaves, stem root decrease in taproot length and its dry mass. The leaves show deficiency symptoms mild chlorosis.

Iron is immovable in the plant. So deficiency symptoms appear on the new growth first.

Correction Measure

Foliar application of ferrous sulfate 0.5% at weekly interval.

Management

Iron deficiency is strongly associated with calcareous soils, anaerobic conditions, and it is often induced by an excess of heavy metals. Good drainage and soil aeration favors iron availability. Low levels of potassium can increase Iron deficiency. In deficient soils, apply Ferrous Sulphate (60 gram/cent or 6 kg/ acre) into the soil.





Manganese



Deficiency Symptoms

Deficiency symptoms appear in the form of interveinal chlorotic mottling of apical part of the second set of leaves. The entire laminae become severely mottled and the interveinal chlorotic areas develop light brown irregular necrotic patches. These patches, which are initially more conspicuous near the leaf apices, later spread to the entire laminae, which eventually turn severely necrotic. Symptoms gradually spread from the middle to the young and old leaves.



Manganese is only moderately mobile in plant tissues. So symptoms first appear on those leaves just reaching their full size.

Correction Measure

Foliar spray of 0.2 – 0.3% MnSO_4 solution 2-3 times at weekly intervals or soil application of MnSO_4 10 kg/ha.

Management

In deficient soils, apply Manganese Sulphate (2.5 gram /liter of water) as foliar spray.

Zinc



Deficiency Symptoms

Prevents seed formation thus reducing yield.

The symptoms are more expressed in the early stages of growth. Middle leaves develop chlorosis in the interveinal areas and necrosis along the apical leaf margins.

Zinc deficiency prevents seed formation thus reducing yield.

Correction Measure

Foliar application of ZnSO_4 0.5% or soil application of ZnSO_4 10 kg/ha.



Management

The deficiency is seen more in poor organic matter. The ideal pH range for zinc availability is 5 to 7.5. Undertake soil testing to confirm deficiency. In deficient soils, apply Zinc sulphate (800 gm /cent or 8 kg/ acre) in the soil.

Zinc fertilizers and phosphate fertilizers should not be used simultaneously. If available phosphate in soil is high, reduce phosphorous application to correct zinc deficiency. In severe cases, foliar spraying of Zinc sulphate (2 gram/liter of water) with Calcium carbonate (2.5 gram/liter of water) can be advocated in morning hours.



Sesame Drought Stress and Selenium

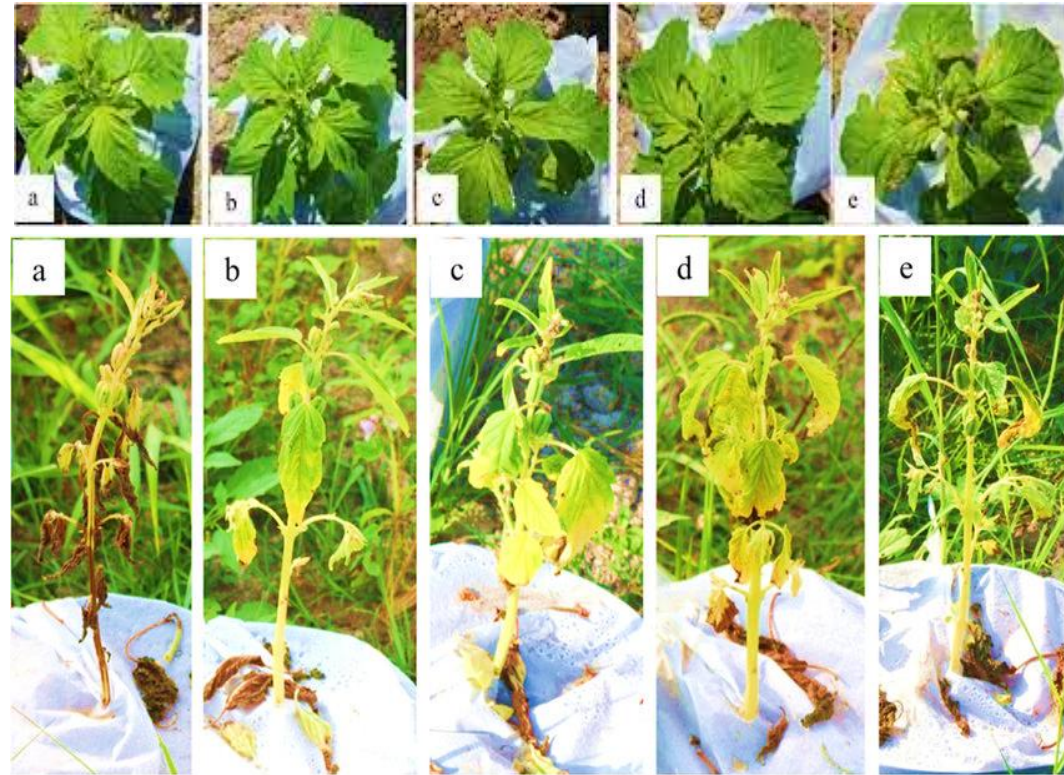


- ❖ Drought stress has to hinder germination, plant growth, flowering, number of capsules per plant, and seed yield. Many approaches have been used to alleviate the effects of drought on crops.
- ❖ Several studies have indicated that micronutrients, such as boron, molybdenum, and silica, help plants to tolerate drought.
- ❖ Although selenium is not an essential element for plant growth, it has been reported to stimulate crop tolerance to drought conditions.
- ❖ At low dosages, selenium imparts diverse beneficial effects and stimulates growth.
- ❖ Many researchers have reported that selenium induces plant drought coping mechanisms by reducing water evaporation, increasing the activities of oxide enzymes such as superoxide dismutase and peroxidase, promoting the synthesis of chlorophyll and carotenoid, and enhancing the accumulation of proline.
- ❖ Proline accumulation is a common response in plants exposed to drought stress. In pea and wheat, proline was the only measured stress marker that was increased primarily by drought stress.
- ❖ Proline, a proteinogenic amino acid, helps osmotic adjustment during stress and protects the native structure of macromolecules and membranes during extreme dehydration.
- ❖ Proline helps plants in the adaptation to drought conditions.
- ❖ Soil or foliar application of selenium can improve the growth and yield of plants; however, selenium spray is more effective than soil application.
- ❖ Currently, there have been limited efforts to understand the role of selenium in sesame under drought conditions.
- ❖ Foliar selenium applications for the sesame DH-1 variety for drought tolerance.

Foliar selenium application for improving drought tolerance of sesame (*Sesamum indicum* L.)



Spraying 5 mg/L of selenium on sesame plants 50 days after sowing helped the plants to tolerate drought conditions. A single foliar selenium application at a concentration of 5 mg/L at the grain-setting stage was able to maintain the number of intact leaves, to increase plant biomass, to enhance proline accumulation in the leaves, and to improve grain yield. The grain weight per plant of plants receiving 5 mg/L of selenium was 18.1% higher than that of plants without selenium treatment. The recommend that field experiments be conducted to confirm the selenium effects on growth and yield of sesame under drought stress conditions.



Sesame plants after 20 days of non-irrigation and after treatments with different selenium concentrations:
(a) 0 mg/L, (b) 5 mg/L, (c) 10 mg/L, (d) 20 mg/L, and (e) 40 mg/L.

Sources: Le Vinh Thuc*, Jun-Ichi Sakagami, Le Thanh Hung, Tran Ngoc Huu, Nguyen Quoc Khuong, Le Ly Vu Vi, Research article (2021) Crop Science Department, College of Agriculture, Can Tho University, Can Tho, Vietnam,



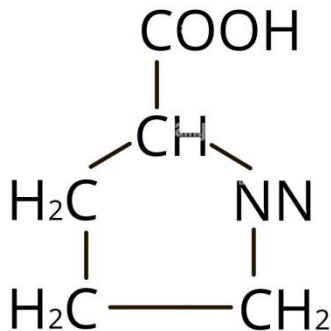
Proline



Proline is an organic acid classed as a proteinogenic amino acid, although it does not contain the amino group -NH₂ but is rather a secondary amine.

The secondary amine nitrogen is in the protonated form under biological conditions, while the carboxyl group is in the deprotonated -COO⁻ form.

Proline



Molar mass: 115.13 g/mol

Formula: C₅H₉NO₂

IUPAC ID: Proline

Solubility: 1.5g/100g ethanol 19 degC

Melting point: 205 to 228 °C

(401 to 442 °F; 478 to 501 K)

(decomposes)

Appearance: Transparent crystals

Classification: Amino Acid, Amine,
Proteinogenic amino acid



Selenium (Se)



Selenium (Se) Chemical element; selenium is a chemical element with the symbol Se and atomic number 34. It is a nonmetal with properties that are intermediate between the elements above and below in the periodic table, sulfur and tellurium, and also has similarities to arsenic.

Nutrition; Selenium is an essential component of various enzymes and proteins, called seleno proteins, that help to make DNA and protect against cell damage and infections; these proteins are also involved in reproduction and the metabolism of thyroid hormones.



➤ **Soil application was more effective.**

Selenate in the soil increased shoot dry matter production.

Foliar application of selenate and selenite increased grain yield.

➤ **What is selenium soil?**

Selenium (Se) combines with both metals and non-metals, directly and hydrochemically. It can form both organic and inorganic compounds.

It is an oxidant as well as a reductant, an important factor in soil formation.

Selenium salts resemble the corresponding sulfur and tellurium salts in behavior.

➤ **What do plants use selenium for?**

Selenium helps to inhibit the damage caused by climate changes such as drought, salinity, heavy metals, and extreme temperature. Also, Se regulates antenna complex of photosynthesis, protecting chlorophylls by raising photosynthetic pigments.

နှမ်းသီးနှံ အထွက်တိုးရန် ငါးစတင်ထုတ်လုပ်မှု စိုက်ပျိုးရေးနှင့် မြေယာရေးရာ ဝန်ကြီးဌာန

နှမ်းသီးနှံသည် စိုက်ပျိုးထုတ်လုပ်မှု တွင် အထွက်အမြောက်အမြား အလွယ်တကူ ထုတ်ယူနိုင်ပြီး အတွက် တောင်သူများ အလွယ်တကူ စိုက်ပျိုးနိုင်ခြင်းကြောင့် လက်ရှိစိုက်ပျိုးနေသော ဆီထွက် သီးနှံများတွင် စိုက်ပျိုးရေးအဖွဲ့အစည်း (၄၉%) မှီသည့် သီးနှံ ဖြစ်ပါသည်။ နှမ်းသီးနှံ တစ်စတန်းတိုင်းအထွက်နှုန်း တင်း (၂၀)နှင့် အထက်ရရှိရန် အောက်ဖော်ပြပါ စိုက်ပျိုးရေး နည်းစနစ်ကောင်းများကို လိုက်နာဆောင်ရွက်ရန် လိုအပ် ပါသည်။

ပြောဆိုချက်အား

မြေဗဟိုစိုက် (၅.၈ - ၇) အတွင်းရှိသော နန်း မြေ သဲနန်းမြေ နန်းစနယ်မြေနှင့် မြေနီသဲဝန်း မြေများတွင် စိုက်ပျိုးပါ။ စိုက်ခင်းမြေပြင်ညီညွတ်စွာ ပြင်ဆင် ထည့်သွင်းပေး အလေးထား ဆောင်ရွက်ပါ။

ပျိုး

ဒေသနှင့် တိုက်ညီဖြစ်ထွန်းမည့် အထွက်ကောင်း မျိုးများကို ရွေးချယ်အသုံးပြုရန်နှင့် စိုက်ပျိုးသင့်သည့် အထွက်ကောင်းမျိုးများမှာ အောက်ဖော်ပြပါအတိုင်းဖြစ်ပါသည်။

မျိုးအမည်	အသက်ရက်	အထွက်နှုန်း (တင်း/စတ)	ထုတ်လုပ်သူ
ဆင်းရဲကုန်-၃	၈၅-၉၀	၂၀	နှမ်းစိုက် (အထွက်အမြောက် များ) တိုက်ပျိုးမျိုး အထွက်ကောင်း
ဆင်းရဲကုန်-၄	၈၀-၈၅	၂၀	အထွက်အမြောက် တင် တိုက်ပျိုး အထွက်ကောင်း
ဆင်းရဲကုန်-၅	၈၀-၈၅	၁၄-၂၃	အထွက်အမြောက် အထွက်အမြောက် ခိုင်ကြံ့ရာသီ သင့်တော်
ဆင်းရဲကုန်-၈	၇၀-၇၅	၁၀-၁၂	အထွက်အမြောက် တိုက်ပျိုးမျိုး
ဆင်းရဲကုန်-၉	၇၀-၇၅	၁၀-၁၂	အထွက်အမြောက် တိုက်ပျိုးမျိုး
ဆင်းရဲကုန်-၁၂	၇၅-၈၀	၁၀-၁၂	အထွက်အမြောက် တင်တိုက်ပျိုး

အပင်ပေါက် (၈၀%) အထက်ရှိသော မျိုးစေ့များကို တစ်စတန်း မျိုးစေ့(၂-၃)ပြည့် အသုံးပြုစိုက်ပျိုးပါ။

စိုက်ချိန်

မိုးနှမ်းကို မေလ ပထမပိုင်းရလျှင် မြင်း အစိုဓာတ်လုံ လောက်ပါက စိုက်ပျိုးရန်နှင့် ဆောင်းနှမ်းကို စက်တင်ဘာ လတွင် အပြီးစိုက်ပျိုးပါ။ မိုးကြိုမေလတွင်နှမ်းကို မတ်လ တွင် အပြီး စိုက်ပျိုးပါ။

စိုက်ခင်း

တစ်စတန်း သတ်မှတ်အပင်ဦးရေ ဝင်ဆုံးစေရန် နှမ်းလျှင် မျိုးများတွင် တပင်တိုက်ပျိုးအတွက် တန်းကြား(၁၂)လက်မ နှင့် ကိုင်းခြားမျိုးအတွက် တန်းကြား (၁၅)လက်မဖြစ်ပြီး နှမ်းကြီးမျိုးအတွက် တန်းကြား (၁၈)လက်မနှင့် ပင်ကြား (၄)လက်မဖြင့် စိုက်ပျိုးပါ။ မျိုးစေ့ကို မြေအောက် (၁.၅ - ၂) လက်မထက် မနက်စေဘဲ အစိုဓာတ်မီအောင် စိုက်ပျိုးပါ။

သွင်းဘားစုထည့်သွင်းအသုံးပြုခြင်း

တစ်စတန်းလျှင် နွားစေ့ (သို့မဟုတ်) မြေစေ့ လှည်း (၅-၁၀)စီး၊ ယူဇိုယား (၅၆)ပေါင်၊ တီဂူပါ (၅၆)ပေါင်နှင့် ဝိုင်တက်ရှ် (၂၈)ပေါင်နှုန်းကို စိုက်ထယ်မေ့ပြင်ချိန်တွင် ထည့်ပါ။ အဖူးစတင်ဝင်ချိန်တွင် တစ်စတန်းလျှင် ယူဇိုယား (၂၈)ပေါင်နှုန်းနှင့် ပန်းဖြိုင်ဖြိုင် ဝိုင်ချိန်တွင် ယူဇိုယား (၂၈)ပေါင်နှုန်းစီ ထပ်မံထည့်ပေးပါ။

အပင်ပြုစုရေးရာခြင်း

အပင်သတ်တမ်း (၁၅)ရက် (သို့မဟုတ်) မှုမှန်ရွက် (၆) ရွက်ထွက်ချိန်တွင် တစ်စတန်းလျှင် သန့်ရှင်းသော တစ်ပင်ချိန် ဖြစ် သားပွဲပါ။ အပင်ပေါက်သည်မှစ၍ ရက် (၃၀)အတွင်း ပေါင်းမြတ် ကင်းစင်အောင် ဆောင်ရွက်ပါ။ နှမ်းအထွက် ကောင်းစေရန် အပင်သတ်တမ်းတစ်လျှောက် အစိုဓာတ် အလိုအပ်ဆုံးအချိန်များမှာ စိုက်ပြီး (၁၅ - ၂၀)ရက်အတွင်း အပင်ဝယ်ရင်ကာလ အဖူးဝင်ချိန်နှင့် ပန်းပွင့်ပြီး (၃၅ - ၄၀) ရက် နှမ်းသီးဖြစ်ပေါ်ချိန်များဖြစ်ပါသည်။ အဆိုပါအချိန်များ တွင် အစိုဓာတ်မလုံလောက်ပါက ရေသွင်းပေးပါ။

ပိုးမွှားဧရာဂါကာကွယ်နှိမ်နင်းခြင်း

အပင်ငယ်စဉ် စုတ်စားပိုးမွှားကုသရန်အတွက် ပင်လုံး ပြန့်ထိတွေ့ပိုးသတ်ဆေး တစ်မျိုးမျိုးဖြင့် ပတ်ဖျန်းနှိမ်နင်း ပါ။ အပွင့်အသီးဖြစ်ချိန်တွင် သီးလုံးဖောက်ပိုးနှင့် နှမ်းထောင် ချိန်တွင် လူပိုးမဲ ကုသရန်အတွက် ထိတွေ့ပိုးသတ်ဆေး တစ် မျိုးမျိုးဖြင့် နှိမ်နင်းပါ။ နှမ်းပိုးဧရာဂါ သယ်ဆောင်သော ဖြုတ်ညှိအား ထိတွေ့ပိုးသတ်ဆေး တစ်မျိုးမျိုးဖြင့် ထိရောက် စွာ နှိမ်နင်းပါ။ နှမ်းပိုးမဲဧရာဂါကုသရန်အတွက်တတ်ပါက မျိုးစေ့ ကို ပို့သတ်ဆေးဖြင့် လူးနယ်စိုက်ပျိုးပါ။

စနစ်တကျ ရိုတ်သိမ်းခြေလှေ့ခြင်း

ရိုတ်ခင်းအတွင်း နှမ်းပင်(သို့မဟုတ်) နှမ်းခင်းတစ်ခု လုံး ရွှေဝါဧရာဂါသစ်လောချိန်တွင် ရိုတ်သိမ်းပါ။ တစ်နည်း အားဖြင့် အထွက်လျော့နည်းနိုင်သည့် အဓိကအကြောင်း အရင်းတစ်ခုဖြစ်သော အောက်သီးကွဲခြင်း မဖြစ်စေရန် မျိုးအလိုက် အသီးပီပြင်သည့် အလယ်သီးများကို ခွဲကြည့် ဖြစ် အရောင်ရင့်ပါက ရိုတ်သိမ်းပါ။ ရိုတ်သိမ်းပြီး နှမ်းများ ကို စုပုံမထားပဲ တိုက်ရိုက်စည်းပြီး နေရောင်အောက်တွင် ထောင်ထားပါ။ နှမ်းများကို ပုံထားပါက နှမ်းမစုတွင်

Free Fatty Acid (FFA) နှင့် ပို့ဝါဝင်မှုများပေး၍ နှမ်းမစု အရည်အသွေး ကျဆင်းစေနိုင်ပါသည်။ သို့ဖြစ်၍ နှမ်းရိုတ် သိမ်းပြီးနောက်ပိုင်း မျှော်မှန်းအထွက်နှုန်းရရှိစေရန် စည်း ထောင်၍ အခြောက်ခံခြင်းကို အလေးထား ဆောင်ရွက် သင့်ပါသည်။ မြေလှေ့သန့်စင်ပြီး နှမ်းများကို မျိုးအဖြစ် အသုံးပြုမည်ဆိုပါက အစိုဓာတ်(၉)ရာခိုင်နှုန်းထိ ရရှိအောင် အခြောက်ခံပြီး လေလုံအောင်ပိတ်၍ သိုလှောင်သိမ်းဆည်း ပါ။



ဆင်းရုတနာ-၁၂

ရိုတ်ချိန်မှစ၍ မြေပြုစေရန်နှင့် စေ့ညှိခြင်းစနစ်ကြီးစွာမှ
ရိုတ်ချိန်မှစ၍ မြေပြုစေရန်
ရိုတ်ချိန်မှစ၍ စေ့ညှိခြင်းစေရန်စွာမှ

နှမ်းသီးနှံ

ရိုတ်ချိန်မှစ၍ စေ့ညှိခြင်းစနစ်ကြီးစွာမှ



၂၀၁၆ ခုနှစ်



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Thank You