

GARLIC, TURMERIC & GINGER FARMERS GUIDE

The Ultimate Farmers Guide

Garlic



Ginger



Turmeric



By: Pascal Logistics International

GARLIC, TURMERIC & GINGER SEEDLINGS & TRAINING

Garlic



Ginger



Turmeric



GARLIC EMPIRE
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**FARMING AND TRAINING IN: KENYA; ZAMBIA; ZIMBABWE; BOSTWANA;
NIGERIA; NIGERIA; SOUTH AFRICA.**

INTRODUCTION OF GARLIC

What is Garlic?



Garlic has a high concentration of sulphur-containing compounds. Thiosulfinates, which include allicin, are the main active components in garlic. It also contains:

High levels of saponins, phosphorus, potassium, sulfur, and zinc.

Moderate levels of selenium and vitamins A and C.

Low levels of calcium, magnesium, sodium, iron, manganese, and B-complex vitamins.

Health Benefits of Garlic:

Garlic Treats Infections

Garlic has an antimicrobial effect on bacteria, yeast, fungi, parasites, and viruses. Allicin and sulfur-containing compounds in garlic inhibit DNA, RNA, and protein production in microbes.

1) Garlic Boosts the Immune System

Garlic extract stimulates white blood cells (lymphocytes, macrophages, monocytes, and neutrophils) by increasing glutathione. White blood cells are immune cells that provide protection against infections, while glutathione is an antioxidant that protects immune cells from free radicals.

2) Garlic Helps Treat Cold and Flu

Garlic extract reduced the severity of colds and the flu by increasing the number of immune cells (T cells and NK cells) and by boosting the immune system.

3) Garlic Treats Yeast Infections

Fresh garlic extract inhibited the growth of

Candida, the most common type of yeast infections. Allicin in garlic inhibits the growth of candida by destroying fats present in the outer surface of the yeast.

4) Garlic Prevents Tooth Decay and Treats Oral Infections

Garlic has antibacterial effects on dental plaque bacteria that cause tooth decay if left untreated. Garlic also treats oral infections like periodontitis, oral thrush, and sore mouth from dentures. Garlic may be used in conjunction with antibiotics or to treat multidrug-resistant bacteria

Allicin in garlic combats bacteria by inhibiting sulfur-containing enzymes that bacteria need for survival.

5) Garlic May Help Treat HIV Infection

Garlic inhibited cell growth and selectively killed HIV-infected immune cells. Diallyl disulfide also inhibits virus replication by decreasing the production of proteins involved in HIV replication

6) Garlic Helps Treat Ulcers Caused By H. pylori

Raw garlic has antibacterial effects against H. pylori, the most common bacterial infection in the world and the main cause of ulcers in human and animal studies. Allicin in garlic reacts with proteins resulting in the inhibition of pathways associated with inflammation.

Garlic oil treats ulcers in rats by increasing the concentration of antioxidant enzymes and by inhibiting proteins that cause inflammation.

7) Garlic Helps Treat Intestinal Infections Caused By Parasites

Garlic treats parasitic intestinal infections like giardiasis and tapeworm infections.

Allicin in garlic disrupts the mobility, food absorption, and reproduction of the parasites by blocking fat synthesis in the parasites.

Garlic also promotes immune function and strengthens the body's defense mechanism against parasitic infections by stimulating white blood cells.

Garlic May Prevent and Help Treat Cancer

S-allylmercaptocysteine (SAMC), a sulfur compound in garlic, decreases the growth of cancer cells and causes the death of cancer cells in cell-based studies. SAMC binds to a protein involved in cell reproduction (tubulin) and disrupts cell growth, activating proteins (JNK1 and caspase-3) that cause tumor cell death.

8) Garlic May Help Treat Brain Cancer

Diallyl trisulfide, a sulfur-containing compound in garlic, decreases the size of brain tumors in mice by inhibiting the enzyme histone deacetylase (HDAC), which causes tumor cell death.

9) Garlic May Prevent Esophagus Cancer

Diallyl sulfide in garlic inhibits esophagus tumor formation in rats by disrupting the energy production of NMBA, which is a chemical found in fungi-contaminated foods that can cause liver and esophagus cancer .

10) Garlic May Stop the Progression of Skin Cancer

Allyl sulfides in garlic control the growth of human skin cancer cells by causing DNA damage in cancer cells in human studies. The DNA damage in cancer cells signals the p53 protein to stop cancer cell growth and to kill cancer cells.

11) Garlic May Slow Down Breast Cancer Growth

Diallyl disulfide in garlic prevents the growth of breast tumors by promoting tumor cell death and inhibiting its growth (via Bcl-2 proteins and the enzyme caspase).

12) Garlic Slows the Progression of and Treats Lung Cancer

Diallyl trisulfide in garlic works in combination with the chemotherapy drug cisplatin to inhibit lung tumor growth in mice. Diallyl trisulfide activates pathways that cause tumor cell death and prevents tumor cell growth (p53, Bcl-2, JNK, p38, and caspase).

13) Garlic May Suppress Stomach Cancer Growth

S-allylmercaptocysteine (SAMC) in garlic suppresses the growth of stomach tumors . SAMC causes tumor cell death by activating the enzymes caspase and protein kinases (MAPK and PI3K/Akt) [R].

14) Garlic May Slow Down Liver Cancer

Progression Sulfur compounds in garlic inhibit liver cancer cell growth by activating proteins (p53, p21, and JNK) that stop tumor cell growth and cause cell death.

15) Garlic May Stop Colon Cancer Progression

Diallyl disulfide and S-allylmercaptocysteine (SAMC) in garlic suppress colon tumor growth by stopping cancer cell growth and increasing tumor cell death in cell.

Diallyl disulfide disrupts the tumor cell cycle by activating the protein ERK. SAMC, which increases tumor cell death by activating the protein JNK1 and the enzyme caspase.

16) Garlic Helps Prevent Bladder Cancer

Garlic inhibits bladder tumor growth by stimulating immune cells and detoxifying carcinogens.

Garlic increases the activity of macrophages and lymphocytes, which attack tumor cells.

Garlic detoxifies carcinogens by activating the antioxidant enzyme CYP2E1.

17) Garlic May Help Stop Prostate Cancer

S-allyl cysteine and SAMC inhibit prostate cancer cells growth by re-activating E-cadherin, a molecule that suppresses tumor invasion, in cancer patients. A low level of E-cadherin is associated with a high number of tumors and poor prognoses in prostate cancer patients.

Garlic Prevents and Treats Skin and Hair Conditions

18) Garlic May Help Treat Allergies

Aged garlic extract suppressed allergic reactions in mice. Ethyl acetate in aged garlic extract may directly suppress the immune protein

FceRI, which is associated with the release of inflammatory factors during allergy responses. Aged garlic extract prevents inflammation during allergic reactions by inhibiting the release of histamine.

19) Garlic Protects the Skin from Ultraviolet Rays

Garlic protects the skin from ultraviolet (UV) radiation by stimulating immune cells in human studies.

When exposed to UV rays, the urocanic acid in the skin changes, which causes suppression of the immune system. Aged garlic extract lessens the suppression of immune cells by decreasing the concentration of urocanic acid.

20) Garlic Has Anti-Aging Effects

Long-term topical treatment with garlic extract may have anti-aging effects since garlic increases the growth and lifespan of skin cells. Garlic-treated skin cells are healthier compared to untreated cells.

Antioxidants in garlic prevent damage caused by free radicals. Garlic also contains cytokinin, a hormone that promotes cell growth and delays aging through its antioxidant effects.

21) Garlic May Help Skin Rashes

Garlic treats skin rashes like psoriasis and eczema. Activation of the compound NF-kB has been linked to skin rashes. NF-kB, which is activated by free radicals, cancer-causing agents, and UV light, causes inflammation.

S-allyl cysteine in garlic suppresses the pathway of NF-kB by inhibiting free radicals and lowering oxidative stress in cell model and human studies.

22) Garlic May Help Remove Scars

Garlic helps treat keloid scars, which tough scars are caused by the overgrowth of skin collagen. Garlic inhibits growth factors, nitric oxide, and enzymes involved in the production of collagen.

23) Garlic Helps with Hair Loss

Garlic gel in combination with steroid cream helps treat patients suffering from alopecia, a type of hair loss that result from immune cells attacking hair follicles. Diallyl disulfide in garlic may prevent the autoimmune response and induce hair re-growth by increasing immune suppressor cells.

Garlic Improves Heart Health and Metabolic Syndrome

24) Garlic Lowers Cholesterol Levels

Garlic lowers total and low-density lipoprotein (LDL) cholesterol by inhibiting cholesterol synthesis in the liver in human and animal studies.

LDL cholesterol is harmful because it clogs blood vessels and increases the risk of heart attacks and stroke.

Garlic lowered cholesterol by deactivating cholesterol-producing enzymes in 70 diabetic patients

25) Garlic Lowers Blood Pressure

Garlic reduces blood pressure in patients with high blood pressure (hypertension). Aged garlic extract reduces blood pressure by increasing calcium and reducing C-reactive protein levels, which cause inflammation and elevated blood pressure.

On the other hand, sulphur deficiency may play a role in hypertension. Allicin is a sulphur compound in garlic that lowers blood pressure by increasing hydrogen sulphide concentrations. Hydrogen sulphide relaxes blood vessels (through nitric oxide) and prevents blood vessel constriction (by endothelin-1).

26) Garlic Helps Prevent Heart Disease

Heart disease is associated with high cholesterol, high blood pressure, increased platelet aggregation, and the hardening of blood vessels. Platelets stop bleeding by clotting blood vessel injuries. However, platelet aggregation also leads to blood clots, which increase the risk of heart disease.

Garlic lowers cholesterol, reduces blood pressure, treats hardened blood vessels, and prevents platelet aggregation in patients with heart disease.

S-allyl cysteine in aged garlic extract inhibits enzymes involved in cholesterol production. Garlic extract also increases the production and function of nitric oxide, which relaxes blood vessels and lowers blood pressure.

Garlic also prevents platelets from binding to proteins (fibrinogen) that form blood clots and increase compounds (cAMP) that inhibit platelet formation.

27) Garlic May Help Prevent Obesity

Garlic prevents obesity by reducing body weight and fat accumulation in mice studies. In animal studies, garlic activates proteins (AMPK and uncoupling proteins) in fat tissue, liver, and muscle, which converts nutrients into heat instead of energy storage.

Ajoene, a compound found in garlic, prevents obesity by decreasing fat tissue in rats. Ajoene generates hydrogen peroxide, which activates enzymes (protein kinases) that kill fat cells.

28) Garlic Helps Treat Diabetes

Diabetes is caused by genetics, obesity, high cholesterol, blood pressure, or blood glucose. Insulin resistance occurs when the body no longer responds to insulin, leading to increased blood sugar levels and a high risk of developing diabetes.

Garlic reduces insulin resistance, blood sugar, and cholesterol levels in patients with diabetes.

Garlic reduced blood sugar levels in rats by decreasing the activity of enzymes (phosphatases and aminotransferases) involved in the transportation of glucose in the liver, a sugar that is the body's main source of energy.

Also, garlic may reduce insulin resistance by inhibiting an enzyme that breaks down drugs (CYP2E1), ultimately disrupting insulin function by increasing oxidative stress.

Garlic Detoxifies the Body

29) Garlic Helps Detoxification by the Liver

Toxins like pesticides, environmental pollutants, and chemicals cause oxidative stress and inflammation in the body. Garlic detoxifies the body through its antioxidant effects. Sulfur-containing compounds in garlic decrease oxidative stress and reduce inflammation.

Garlic detoxifies the liver by increasing the activity of detoxifying enzymes glutathione S-transferase (GST) and CYP2B. Garlic also inhibits

CYP2E1 enzymes, which produce free radicals and cause oxidative stress-induced damage and inflammation.

30) Garlic Helps Damage Caused By Liver Toxicity

Garlic powder protects against damage from liver toxicity caused by high doses of antibiotics, Tylenol, and lead in rat studies. Garlic acts as an antioxidant and prevents oxidative stress by stabilizing free radicals. The decrease in oxidative stress may increase the activity of antioxidant enzymes, which prevents further damage to the liver.

31) Garlic Helps Damage Caused By Kidney Toxicity

Garlic helps treat kidney failure caused by the antibiotic gentamicin and kidney damage caused by cisplatin, a chemotherapy drug.

S-allyl cysteine, a sulfur compound in garlic, acts as an antioxidant by inhibiting free radicals, which cause cellular damage in the body. By lowering free radicals, it increases the activity of antioxidant enzymes in the kidney. S-allyl cysteine also inhibits the enzymes that produce free radicals.

Garlic Improves Brain Functions

32) Garlic Prevents Brain Damage Caused By Aging and Brain Diseases

Free radicals are highly unstable molecules that are formed when oxygen is used in the body to produce energy. Bodily antioxidants inhibit free radicals by stabilizing the molecules. Without enough antioxidants, free radicals cause cellular damage in the body.

S-allyl cysteine is an antioxidant found in aged garlic extract that protects against brain damage in a cell model study. S-allyl cysteine activates antioxidant enzymes in the brain (hippocampus) that decreases free radicals preventing damage.

33) Garlic Improves Memory

Garlic increases brain serotonin, a neurotransmitter that enhances Cognitive performance. Garlic oil improves memory function and cognitive performance.

GARLIC FARMING



Garlic is an annual bulbous herbaceous plant in the family Amaryllidaceae, which is grown for its pungent, edible bulb.

The plant can either have a short, woody central stem

(Hard neck)



Or a softer pseudo stem made up of overlapping leaf sheaths

(Soft neck).



Hard neck varieties produce a false flower stock which is known as a **Scape** and produce larger garlic cloves but in smaller numbers while soft neck garlic produces relatively smaller cloves and has a stem which is very short and flattened and gives way to a pseudo stem.



The garlic plant can have 6–12 flat, blade-like leaves which can stretch up to 50 cm long and it can reach 60 cm in height.

Garlic scapes



Garlic is majorly used for:

- flavouring food
- Can be dried, ground or powdered for this purpose.

Ecological Requirements

Garlic is a hardy perennial which can be grown in a variety of soil types.

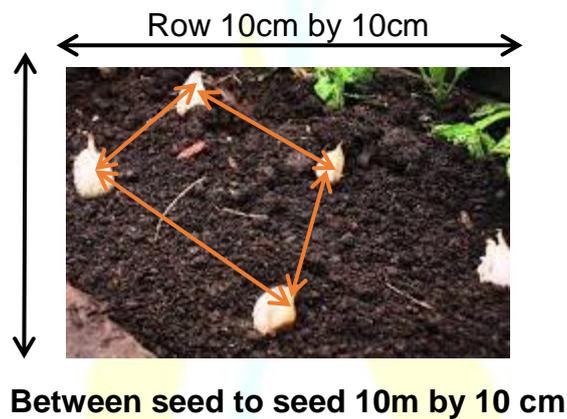
The plant performs best in a light, well-draining, organic soil with an optimum **pH of between 6-7**. It grows well in cool weather but can tolerate a temperature range of from 9–35 degrees centigrade. Garlic should be planted in an area that receives full

sun for most of the day because it requires a period of cold followed by a period of light and heat in order to develop properly.

Planting & Cultural Practices

Most garlic varieties do not produce fertile seed and therefore, the plant is mostly propagated from the cloves. The individual cloves are obtained by breaking apart the bulb.

Cloves should be planted **2 cm deep**, leaving **8–10 cm** between individual plants and **8-10 cm between rows**. They should be planted with the pointed side up and the basal plate positioned downwards.



- Roots grow from the basal plate.
- Each clove produces a whole head of garlic.



Irrigation: the plant requires additional irrigation during dry periods but watering should be ceased a few weeks prior to harvesting, in order to allow the papery skin around the bulb to dry and to prevent the development of disease.

Pruning: the hard neck garlic should be pruned when the flowering stalks/scapes begin to straighten. Removal of the flower head directs the plant's energy to bulb production.

Softneck garlic does not require pruning.

Weeding: weeds compete with the crop for growth factors and also harbour pathogens. Garlic is a poor competitor with weeds and therefore the garden should be kept weed free.

WEEDING



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Mulching: this helps in retention of moisture and suppression of weeds. When the mulch decomposes, it releases nutrients into the soil which are absorbed by the plants.

MULCHING



Pests & Disease Control

Pests

Onion maggot: infestation causes stunting or wilting of seedlings and plants commonly break at soil line if an attempt is made to pull it up. If infestation occurs when plants are bulbing, bulbs become deformed and susceptible to storage rots after harvest.

ONION MAGGOTS



Thrips: these cause significant economic losses. They cut the epidermis of the leaves or stem and suck the plant sap creating white silvery patches on the deformed leaves.

THRIPS



Nematodes: the common symptoms due to infestation include an erratic plant stand developing in the field, stunting of plants, yellowing, deformed bulbs, and stem swelling. Root system lacks fine roots and round or irregular lesions form on roots.

NEMATODES



Diseases

Garlic mosaic virus (GarMV):

Infection causes formation of mosaic patterns on leaves, chlorotic mottling or streaks on leaves, stunted plant growth and reduced bulb size. It is transmitted by aphids.

GARLIC MOSAIC VIRUS



Damping off:

These results in seed and seedling rot before they emerge out of the soil. The pathogen can also attack the collar region of seedlings on the surface of soil, which rots and ultimately the seedlings collapse and die.

DAMPING OFF:



Bacterial soft rot:

This is mainly a problem on mature bulbs. Affected scales first appear water-soaked and pale yellow to light brown. As the disease progresses, invaded fleshy scales become soft and sticky with the interior of the bulb breaking-down. A watery, foul-smelling thick liquid can be squeezed from the neck of diseased bulbs.

BACTERIAL SOFT ROT:



Purple blotch:

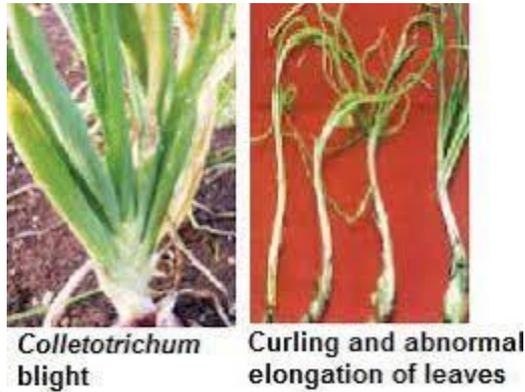
The symptoms occur on leaves and flower stalks as small, sunken, whitish flecks with purple coloured centres. These lesions may girdle leaves/stalk and cause their drooping. Infected plants fail to develop bulbs

PURPLE BLOTCH:



Colletotrichum blight/anthracnose/twister disease:

Symptoms due to infection appear initially on the leaves as water soaked pale yellow spots, which spread lengthwise covering entire leaf blade. Affected leaves shrivel and droop down.



Fusarium basal rot/basal rot:

Initially yellowing of leaves and stunted growth of plant is observed, which later on dry from tip downwards. In early stage of infection, the roots of the plants become pink in colour and rotting takes place later while in advanced stage, the bulb starts decaying from lower ends and ultimately whole plant dies.

FUSARIUM BASAL ROT/BASAL ROT



White Rot:

The initial symptoms are yellowing and dieback of leaf tips. Later, scales, stem plate and roots get destroyed. The bulbs become soft and water soaked, and as infection progresses, white fluffy or cottony growth of mycelium with abundant black sclerotia resembling mustard grain develops on the infected bulbs.

WHITE ROT



Downy Mildew:

Symptoms of this disease are quite distinct. A whitish, furry growth occurs on the leaves, along with yellow discoloration. Infection can kill younger plants and stunt the growth of older ones. Diseased leaf tips and other tissues eventually collapse. Bulbs in storage develop a blackened neck, become shriveled, and outer scales become water-soaked. Some bulbs may sprout prematurely.

DOWNY MILDEW:



Botrytis Rot:

Infection causes the stems to develop water-soaked and gray fuzzy fungal growth. This disease is also called “neckrot.”

BOTRYTIS ROT:



Penicillium Decay:

Infection causes seed clove decay often resulting in stunted, wilted, and yellowing plants. Disease can also reduce growth. The fungus may sporulate on diseased cloves, appearing as a bluish-green mass.

PENICILLIUM DECAY:



Black mould:

Infection usually is through neck tissues as foliage dies down at maturity. The infected bulbs become discolored black around the neck, and affected scales shrivel. Masses of powdery black spores develop as streaks along veins on and between outer dry scales. Infection may advance from the neck into the central fleshy scales.

BLACK MOULD:



Maturity, Harvesting & Post-Harvest Handling



Garlic is ready for harvesting when the plants begin to turn yellow or brown and begin to fall over.

The bulbs are harvested by digging the plant carefully and lifting the bulbs using a fork. In large scale onion/potato lifters can be used to lift the bulbs. This should be done while there are still some green leaves remaining on the plant.



The harvested garlic can be used straight away or it can be cured for longer storage.

Curing garlic can be achieved by hanging the plants in bunches or by spreading them out on a rack or screen. The plants should be kept intact while they cure; the tops should not be removed until the garlic is dry. This should be carried out in a cool, dry place with good ventilation.



Once completely dry, the bulbs can store for up to a year.

Garlic is stored in net bags, crates, in pallet boxes, or in bulk bins. When stored in bins or boxes, there should be at least some vent space. Bags of garlic are usually stored on pallets and should be stacked to allow proper air circulation.



NUTRITION IN GARLIC

Reactions on this Item Garlic requires frequent applications of fertilizer in order to produce the highest yields and the largest, best quality bulbs.

A proper nutrition should be ensured by supplying the crop with both macro and micronutrient elements which is achieved by application of basal and foliar fertilizers.

Basal fertilizers e.g. DAP and CAN, are absorbed by the crop through the roots while foliar feeds e.g.

Soil analysis should be done in order to determine the amount of nutrients present before planting and manure can be added, depending on the organic matter levels of the soil.

FERTILIZER APPLICATION SCHEDULE (IS ATTACHED AT THE BACK)

The crop needs different nutrients levels and composition at different growth stages. Proper timing is very critical for best results.

Early growth stage

This is the period between planting about 2-3 weeks after the sprouting of the cloves.

The planting site should be drenched with OPTIMIZER 20ml/20l which helps in breaking dormancy and ensuring uniform sprouting.

In order to promote strong early growth, maximise root development, ensure good shoot growth and supply food reserves to the young crop, Application of DAP is very crucial during this stage.

Vegetative growth

During this time the crop is actively growing and making food in order to accumulate enough resources for utilization during bulbing.

To ensure continued growth and development, maintain vigorous, healthy leaf growth and to ensure that photosynthetic growth is not limited, the size of the bulb is

majorly dependent upon the health level of the green leaves or tops at the time of bulb maturity.

Top dressing is mostly done using CAN, although other basal fertilizers like NPK 23:23:0 could also be applied at this stage.

Reproduction stage

This entails bulb formation, development and maturity. The crop should be supplied with adequate nutrients during this stage in order to achieve the best.

Maintaining leaf growth

Maintaining early growth and bulb development

Maximizing dry matter and general quality of the bulbs

Maintaining bulb firmness and size

Ensuring ripening and early maturity

Improving the storage quality of the bulbs

Potassium-rich basal fertilizers like NPK 17:17:17 should be applied during this stage.

Tips!

Spray the crop with OPTIMIZER 10ml/20l at all stages. It is an organic seaweed biostimulant for crop growth and stress management.

All basal fertilizers (e.g. DAP, CAN, etc.) and manure should be mixed with HUMIPower at the rate of 1kg Humipower into 50kg fertilizer or 1 ton of manure. It is an excellent soil amendment and fertilizer blend.

Whenever spraying the foliar fertilizers, it is advisable to always mix them with INTEGRA 3ml/20l. This is a sticker, spreader and penetrant which improves the absorption level of the fertilizer by the foliage of the crop.

Fertilizer application timing has a significant effect on crop yields. Proper timing of the fertilizer application increases yields, reduces nutrient losses, increases nutrient use efficiency and prevents damage to the environment.

Repeat foliar sprays on weekly basis while still monitoring the general performance of the crop.

INTRODUCTION OF GINGER

What Is Ginger?



Ginger is a spice originated from the rhizomes of the plant *Zingiber officinale*. It is commonly used in many Asian, Ayurvedic, and Middle Eastern dishes.

In fact, ginger is one of the most commonly consumed dietary condiments in the world.

Ginger use dates back to 3000 years ago in India. It's been used for thousands of years as a remedy for diverse health issues, such as colds, nausea, pain, arthritis, migraines, and high blood pressure.

As a strong antioxidant ginger also fights microbes and reduces inflammation.

Ginger is a relative of **curcumin** and **cardamon**, as they all belong to the same plant family.

A lot of ginger and its metabolites accumulate in the gut. That's why it's most commonly used for gastrointestinal issues.

It's a great food to eat when following the lectin avoidance diet.

Active Ingredients in Ginger

Over 100 active compounds have been identified in ginger, fresh or dried!

Gingerols are the major compounds in fresh ginger and less so in dry ginger.

Shogaols are produced from gingerols during the drying process and are present in higher amounts in dried ginger.

Ginger also contains zingerone, zerumbone, pungent oleoresins, some terpenoids and flavonoids.

All of these compounds are antioxidants, while some of them have anti-tumour, anti-inflammatory, pain-relieving, antimicrobial, and liver-protecting activities.

Health Benefits of Ginger

1) Ginger Reduces Inflammation

Ginger strongly reduces the inflammation marker CRP in the blood.

It seems to be the pungent components in ginger, also known as oleoresins, that have the strongest anti-inflammatory.

Ginger stopped the release of inflammatory cytokines in immune cells. It could reduce the important inflammation-causing TNF-alpha, as well as IL-1 beta.

Some other ginger benefits listed below — such as reducing pain, cramps, and arthritis — are also tightly linked to this key anti-inflammatory activity.

2) Ginger is a Natural Painkiller

Ginger is an effective and safe natural painkiller; Ginger worked as well as the popular painkiller diclofenac (an NSAID also known as Voltaren)

3) Ginger Helps with Menstrual Cramps

Ginger reduced PMS and menstrual pain in 6 trials (RCTs). It was much more effective than placebo and as effective as a painkiller commonly used for menstrual cramps (mefenamic acid, an NSAID)

4) Ginger May Help with Osteoarthritis

Ginger improved the osteoarthritis symptoms in some studies. A standardized ginger extract could reduce the symptoms over 6 weeks. The extract was safe and caused only mild stomach upset.

5) Ginger May Help with Allergies and Asthma

Ginger is probably better for people with Th2 dominance. helping rebalances the immune system and reduces allergies. Ginger-treated asthmatic symptoms, mucus, and lung inflammation.

6) Ginger Helps with Eczema

6-Shogaol, a ginger compound, reduced eczema; TNF-alpha plays a role in eczema symptoms, such as redness and skin eruptions.

Interestingly, eczema is a mixed Th2/Th1 condition, and ginger managed to keep all inflammatory immune substances and pathways under control.

7) Ginger Protects the Stomach

Ginger increased protective prostaglandins in the stomach lining Cellular studies confirm that ginger reduces stomach damage. Antioxidants in ginger blocked the growth of stomach-ulcer-causing H.Pylori , mainly by fighting free radicals.

8) Ginger Helps with Nausea and Vomiting

Ginger is a popular natural remedy for morning sickness during early pregnancy.

The effects of ginger on nausea are linked to the vagus nerve, the activation of which is usually beneficial. However, over-activating some serotonin receptors (5HT3) in vagus nerve pathway to the gut causes nausea and vomiting Ginger reduces nausea and vomiting probably by blocking excess serotonin and vagus nerve activation in the stomach and gut.

9) Ginger Reduces Stomach Discomfort

Ginger has a long history of use for digestive disorders. It can both increase gut flow to boost digestion and alleviate painful stomach spasms.

10) Ginger Protects the Liver

Ginger helped slow down aging-related liver damage in old rats. It was compared to alpha- lipoic acid, which had even stronger effects.

Ginger Helps with Non-Alcoholic Fatty Liver Disease

11) Ginger Is an Antioxidant

Many active components in ginger and its essential oil, such as gingerol and shogaol, are potent antioxidants.

They can scavenge free radicals throughout the body and neutralize them — crucial for preventing numerous chronic diseases.

This antioxidant activity underlies the immune-balancing and tumor-fighting benefits of ginger, demonstrated in animal and cell studies.

12) Ginger May Fight Cancer

Triggering Cancer Cell Death

Compounds from a specific steam distilled ginger extract caused cancer uterine cells to die (via apoptosis).

This extract reduced the activity of cancer-causing Bcl2 genes by 90% and increased the activity of cancer-fighting genes (p53) Zerumbone, another ingredient in ginger, triggered pancreatic cancer cell death by acting on the same cancer-fighting pathway (p53). It could also enhance the effects of radiation, making colorectal cancer cells more sensitive to it.

Pungent components from fresh ginger blocked the growth of liver and bone cancer cells. Their antioxidant action rendered the cancer cells less invasive.

13) Ginger Protects the DNA

Ginger protected sperm DNA against oxidative damage.

14) Ginger Protects the Heart

Ginger can reduce an important inflammation marker (CRP), increase

HDL and reduce triglycerides means that ginger may protect the heart and prevent heart disease.

It also lowered blood pressure.

6-Gingerol can protect blood vessel cells from oxidative stress, which may help prevent hardening of the arteries.

15) Ginger Improves Blood Sugar Levels

Ginger can reduce fasting blood

Glucose and HbA1c, a marker of long-term glucose levels.

16) Ginger May Prevent

Weight Gain

Ginger could keep mice on a high-fat diet from gaining excessive weight. It enhanced fat burning and improved their exercise endurance by activating the PPAR delta pathway.

17) Ginger Fights Microbes

Ginger could kill viruses, bacteria, and yeast in numerous cellular studies. Effectiveness of ginger for various types of infections. Ginger did enhance the effects of anti-tuberculosis drugs in humans, but no clinical studies have explored it yet as a stand-alone remedy.

Fresh Ginger Fights the Flu

Ginger Kills Bacteria

Ginger extracts also blocked the growth of 19 strains of stomach-ulcer-causing *Helicobacter pylori*, including the drug-resistant ones.

Ginger Kills Yeast and Fungus

In cells, ginger could kill 13 types of fungus that cause human diseases.

Ginger tincture blocked the growth of *Candida* in test tubes.

18) Ginger in Men for Boosting Testosterone

Ginger is able to boost testosterone levels in men, especially in those who are under oxidative stress; it also increased testosterone-boosting hormones, sperm count and sperm.

19) Ginger May Boost Cognition

Ginger extracts enhanced cognition and working memory.

COMMON GINGER VARIETIES IN

There are two common varieties like the land race with small rhizomes and the hybrid with big rhizomes.



Utilization

- Ginger is sold as whole raw rhizomes, dried and powdered ginger, preserved or 'Stem' ginger also crystallized and pickled ginger.
- Fresh ginger is used in pickles, chutneys and curry pastes. Dried and ground ginger is a constituent of many curry powders?
- Rhizomes produce green sprouts which can be finely chopped added to a green Salad.
- Dried ginger is used in cakes, biscuits, bread, puddings and jams and in some drinks like ginger beer, ginger wine and tea.

The following article talks about "Ginger Farming" or "**How to grow Ginger**".

Introduction: - Ginger is a very important commercial crop grown for its aromatic rhizomes which is used both as a spice and a medicine.

Ginger of commerce is the dried rhizome. It is marketed in different forms such as raw ginger, dry ginger, bleached dry ginger, ginger powder, ginger oil, ginger oleoresin, gingerale, ginger candy, ginger beer, brined ginger, ginger wine, ginger squash, ginger flakes etc. Ginger is the rhizome of *Zingiber officinale* Rosc., a herbaceous perennial belonging to Zingiberaceae, and is believed to be native of south-eastern Asia.



It is propagated through rhizomes. The rhizomes put forth erect, leafy stems, 30-90 cm in height.



The base of the leaves sheathe the stem. The leaves are dark green, 15-20 cm long, narrow, lanceolate and with a prominent midrib. The flowers are small, yellowish, speckled, each with a purple speckled lip and borne on a spike. When the plants are about 9 months old, the green leaves turn yellow. Ginger produced in India, goes for domestic consumption and only a small quantity is exported.



Climate for Ginger Farming:-

Ginger grows in warm and humid climate. It is mainly cultivated in the tropics from sea level to an altitude of above 1500 MSL and it can be grown both under rain fed and irrigated conditions. For successful cultivation, ginger requires a moderate rainfall at the sowing time till the rhizomes sprout, fairly heavy and well distributed showers during the growing period and dry weather for about a month before harvesting.

GARLIC EMPIRE GROUP: GINGER, GARLIC & TURMERIC FARMING

- Soil for Ginger Farming: - Ginger thrives best in well drained soils like **sandy or clay loam, red loam or lateritic loam**.
A friable loam rich in humus is ideal. However, being an exhaustive crop it may not be desirable to grow ginger in the same site year after year. It thrives well under partial shade, though it is also grown on a large scale in open areas.

Inter-Crop in Ginger Farming :-

- Ginger can be cultivated organically as an inter or mixed crop provided all the other crops are grown following organic methods. It may be intercropped with shade-giving plants, e.g. banana, pigeon-pea, tree castor and cluster bean (guar). Ginger is grown as a mixed crop, in coconut, young coffee and orange plantations on the west coast. At higher altitudes in Himachal Pradesh, ginger is inter cropped with tomato and chilli.



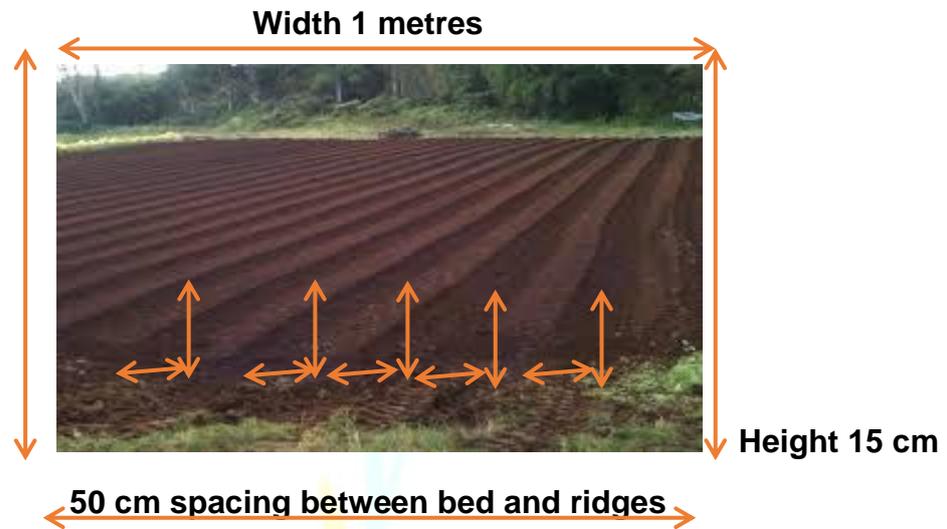
Buffer zone:

In Ginger Farming: - In order to cultivate ginger organically, a buffer zone of 25 to 50 feet is to be left all around the conventional farm, depending upon the location of the farm. The produce from this buffer zone belt shall not be treated as organic. Being an annual crop, the conversion period required will be two years.



Land preparation for Ginger Farming:-

While preparing the land, minimum tillage operations may be adopted. **Beds of 15 cm height, 1 m width**



and of convenient length may be prepared giving at least **50 cm** spacing between beds.



Solarisation of the beds is beneficial in checking the multiplication of pests and disease causing organisms. Solarisation is a technique by which moist beds in the

field are completely covered with polythene sheets and exposed to sun for a period of **20-30 days**. The polythene sheets used for soil solarisation should be kept away safely after the work is completed

Planting material in Ginger Farming:-

Carefully preserved seed rhizomes free from pests and diseases which are collected from organically cultivated farms can be used for planting. However, to begin with seed material from high yielding local varieties may be used in the absence of organically produced seed materials. Seed rhizomes should not be treated with any chemicals.

Planting in Ginger Farming :-

- In Ginger Farming, at the time of planting, apply 25 grams of powdered neem(Azadirachta indica) cake and mix well with the soil in each pit.
- Ginger is planted in rows, **25 cm** apart at distances of **20-25 cm** within the row. In the case of the irrigated crop, ridges are made **40-45 cm** apart and Ginger planting is done in shallow pits on top of the ridges at distances of **24-30 cm**.
- Bits of seed-rhizomes weighing **20-30 g** each and having at least one bud are planted at the given spacing. While planting, seed rhizomes mixed with well rotten cattle manure or compost
- Put in shallow pits and covered with a thin layer of soil and levelled. About 600 –1000kg of seed-rhizomes are required to sow one acre of land. Higher seed-rates are used for planting at higher altitudes.
- **The irrigated Ginger crop is watered immediately after sowing.** The beds of the rain-fed crop are covered with leaf mulch as protection against sun and heavy rains and for consequent enrichment of organic matter in the soil. In some areas, farmyard manure is used as mulch. Seeds of cluster-bean, pigeon-pea or castor are sown on irrigation channels on the corners of the raised beds for shade. The shoots emerge in 10-20 days.
- **Water supply/Irrigation in Ginger Farming:** - Proper drainage channels are to be provided in the inter rows to drain off stagnant water. Irrigation is given at varying intervals of 5 – 10 days as and when required.
- **Cultural practices in Ginger Farming:** - Mulching ginger beds with green leaves is an important operation in ginger farming. Apart from being organic manure, it helps in soil and water conservation.

Mulching may be done with green leaves thrice in ginger, once immediately after planting @ 4 to 5 tonnes /acre to enhance germination, increase organic matter, and conserve soil moisture and prevent washing of soil due to heavy rains.

Dry leaves



plastic film for mulching



It is repeated @ 2 tonnes /acre at 40th and 90th day after planting preferably at the time of weeding, hoeing and earthing up. Leaves as mulch may reduce the infestation of shoot borer. Cow dung slurry or liquid manure may be poured on the bed after each mulching to enhance the microbial activity and nutrient availability.

Weed Control in Ginger Farming:-

- Two weeding are generally given to the crop. The first weeding just before the second mulching and repeated depending on the intensity of weed growth. The weeded material may be used for mulching. If necessary weeding is to be repeated a third time. Plants are earthed up once or twice.



Manuring

In Ginger Farming: - Ginger requires heavy manuring. Application of well rotten cow dung or compost @ 2.5 to 3 tonnes / acre may be made as a basal dose while planting the rhizomes in the pits. In addition, application of neem cake @ 800 kg / acre is also desirable.



PESTS AND DISEASES IN GINGER FARMING :-

Shoot borer:

Is the major pest infesting ginger farming? Regular field surveillance and adoption of phytosanitary measures are necessary for pest management. It appears during July -October period. Spot out the shoots infested by the borer and cut open the shoot and pick out the caterpillar and destroy them. Spray neem oil (0.5%) at fortnightly intervals if found necessary. Light traps will be useful in attracting and collecting the adult moths.

Shoot borer



Soft rot or rhizome rot:

Is a major disease of ginger farming? While selecting the area for ginger cultivation care should be taken to see that the area is well drained as water stagnation pre-disposes the plants to infection. Select seed rhizomes from disease free areas since this disease is seed borne. Solarisation of soil done at the time of bed preparation can reduce the fungus inoculum. However, if the disease is noticed, the affected clumps are to be removed carefully along with the soil surrounding the rhizome to reduce the spread.

Soft rot or rhizome rot:



Infected plants and rhizome

HARVESTING, CURING AND YIELD OF GINGER:-

The Ginger crop is ready for harvesting in about **8 to 10 months** depending upon the maturity of the variety. When fully mature the leaves turn yellow and the pseudo stems begin to dry. Rhizomes are lifted either with a digging-fork or with a spade. They are cleaned of roots and adhering soil particles.



Harvested Ginger.

- The green ginger is soaked in water to facilitate the removal of the skin. The skin is scraped off with pieces of sharpened bamboo. The scraped produce is washed and dried in the sun for **3 or 4 days** and hand-rubbed.
- It is again steeped in water for two hours, dried and then rubbed to remove all the remaining bits of the skin.
- Sun-drying also bleaches the produce. Peeling should be done with great care and skill. The essential oil which gives ginger the aromatic character is present in the epidermal cells and hence excessive or careless scraping will result in damaging these cells leading to the loss of essential oils. Steel knives are not used as they are found to stain the produce. Storage of dry ginger for longer periods is not desirable.
- The yield of dry ginger is **15-25 percent** of the fresh ginger depending upon the variety and location where the crop is grown. Burning of sulphur for processing ginger is not allowed.
- The average yield of green ginger is estimated at about 6 to 10 tonnes per acre.

- The recovery of dry ginger varies from **16 – 25 per cent**.

Preservation of seed in Ginger Farming:-

The rhizomes to be used as seed material should be preserved carefully. Indigenous practices like spreading layers of leaves of *Glycosmis pentaphylla* being followed by farmers can very well be adopted for this purpose. In order to get good germination, the seed rhizomes are to be stored properly in pits under shade.



For seed material:



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Big and healthy rhizomes from disease-free plants are selected immediately after harvest. For this purpose, healthy and disease-free clumps are marked in the field when the crop is **6 – 8 months** old and still green.

Seed rhizomes are stored in pits of convenient size made in the shed to protect from the sun and rain. Walls of the pits may be coated with cow dung paste. Seed rhizomes are stored in these pits in layers along with well-dried sand/saw dust (i.e. put one layer of seed rhizomes, then put **2 cm** thick layer of sand/saw dust). Sufficient gap is to be left at the top of the pits for adequate aeration.

Seed rhizomes in pits need inspection once in twenty days to remove shrivelled and disease affected rhizomes. Seed rhizomes can also be stored in pits dug in the ground under the shade of a tree provided there is no chance for water to enter the pits. In some areas, the rhizomes are loosely heaped over a layer of sand or paddy husk and covered with dry leaves in thatched sheds.



INTRODUCTION OF TURMERIC

What Is Turmeric?



Internationally as a staple spice in cuisine, an element of holistic medicine, an offering in religious ceremonies, and even a coloring in cosmetics, turmeric has been providing the world with countless uses and immense health benefits for thousands of years. The scientific name for the plant is

Curcuma longa, a well-known perennial belonging to the ginger family of Zingiberaceae.

Turmeric's beautiful bright yellow root has led to its nicknames "the golden spice" and "Indian saffron." It has graced countless cultures around the world with its gorgeous coloring, unique aroma, and unmistakable flavor. Available in a natural state of the whole turmeric root or in powdered, pressed, extract or supplement forms, turmeric can provide countless

Preventative and healing measures.

A Brief History

Native to the southwest of India, turmeric root has been a staple of Ayurvedic medicine for more than 4,000 years. Turmeric benefits and usage and has spread recently around the world to contribute to the healing and preventative medicinal applications of countless conditions. Around 700, the turmeric plant is thought to have arrived in China. The earliest record of the plant is in one of the first Ayurvedic scientific and medical documents, the Sanskrit text

Compendium of Caraka (written between the fourth century b.c.e. and the second century c.e.), which recommended turmeric as an efficient remedy for food poisoning.

Turmeric became a staple of the culture and cuisine of India, where they utilized the root for multiple applications. People in India became such devout believers in the root's healing and protective powers that they became planters and suppliers; India now produces more than **80 percent** of the world's turmeric root. With more than **3,000 studies** published in peer-reviewed journals in the last twenty-five years showing the amazing health benefits of turmeric, turmeric has made quite an entrance into the Western medicinal world.

Turmeric's Unique Chemical Profile

Turmeric contains more than **100** astounding chemical compounds that contribute to its ability to help treat conditions from stomachaches to respiratory illness. These chemical compounds are what make turmeric unique. Most importantly, turmeric contains curcumin, which is a polyphenol. Polyphenols are organic chemicals that have been shown to have anti-inflammatory properties. Polyphenols are also present in other foods and beverages, such as epigallocatechin in green tea, capsaicin in chili peppers, and resveratrol in red wine and fresh peanuts. Curcumin is what gives turmeric root its beautiful yellow-orange color. Curcuminoids, the group of chemical compounds responsible for the health benefits of turmeric, include curcumin, demethoxycurcumin, and bisdemethoxycurcumin. Turmeric also contains volatile oils, including tumerone, artumerone, and zingiberene.

Curcumin is the part of turmeric that has been studied most frequently for its uses as a dietary turmeric supplement and in food coloring and cosmetics.

Turmeric extracts may have antifungal and antibacterial properties. The National Institutes of Health lists more than eighty studies that are looking into turmeric's benefits and ability to treat and heal issues, from irritable bowel syndrome to diabetic nephropathy. Turmeric's unique chemical composition of vitamins, minerals, fiber, and phytochemicals provide the body with:

- + Promotion of immunity
- + Protection against illness and disease
- + Prevention of the development of serious illness and disease
- + Destruction of chronic disease cells within the brain and body

Thanks to these properties, turmeric has now been integrated into natural treatment methods for common and chronic conditions.

The Special Benefits of Turmeric

The turmeric root possesses natural oils, amino acids, vitamins, minerals, fatty acids, and phytochemicals that combine to provide healing properties for almost every area of the body. Phytochemicals are naturally occurring plant compounds that boost the healthy functioning of cells, tissues, organs, and systems. These compounds include antioxidants, anti-inflammatory agents, analgesics, and a wide variety of protective, preventative, and health-promoting derivatives that help support the natural functions of the body.

The powerful phenols contained within the flesh of the turmeric root are varieties of curcuminoids: curcumin, desmethoxycurcumin, and bisdesmethoxycurcumin, which not only help combat germs, bacteria, and viruses but also help aid in digestive processes, support immunity, improve energy, maximize metabolic functioning, cleanse the blood, regulate blood sugar, and increase mental processes.

It is these compounds that are responsible for turmeric's numerous health benefits. Turmeric also contains quercetin, a plant pigment that gives many fruits and

vegetables their color. They are antioxidants, scavenging free radicals, which can damage cells.

The Health Benefits of Turmeric

1. Reduces the Risk of Cancer

Antioxidants are key to the topic of cancer resistance.

2. Provides Natural Anti-Inflammatory Agents

Inflammation is a common cause of pain and discomfort, and can even contribute to the development of serious illnesses and disease.

Chemical compounds in turmeric, such as curcumin, combine with vitamins and minerals that support the body's natural processes of fighting

3. Boosts Immunity

You probably know that your immune system is responsible for protecting the body from the development of illness and disease.

Turmeric to your daily diet can provide the body with these protective immunity-boosting benefits for greater health naturally.

4. Balances Hormone Levels

Hormones are involved in every imaginable process that takes place in the brain and body. Coursing through the body with ease, these hormones are necessary to support life functions of all kinds. Digestion, muscle contraction, nervous system functioning, sleep, and mood can all be attributed to Turmeric is able to supply an ample amount of nutritive support to the body's hormonal production processes.

- + Improves immunity by supplying phytonutrients that prevent illness, disease, and mutations that can hinder hormonal production
- + Cleanses the blood of toxicity
- + Crosses the blood-brain barrier for immediate on-site delivery of phytochemicals
- + Regulates and supports the health of all organs involved in hormone production

5. Prevents Hair Loss

Hair loss can almost always be attributed to a nutritional deficiency. Whether the deficiency is due to a poor diet, lifestyle choices, or hereditary conditions, the failure of the body to absorb and utilize essential nutrients can adversely affect multiple physical processes, including the production and retention of hair. The hair follicles can be compromised, leading to a minimal production of new hair growth and inability to retain existing hair. Fighting free-radical damage that can leave the scalp riddled with health issues, turmeric's beneficial polyphenols help to counteract the health issues and conditions that can cause hair loss.

6. Encourages Proper Digestion

One way that turmeric benefits the body is by aiding the digestive system. Your digestive system consists of multiple parts that work together to move and process the food you eat. From the saliva in the mouth (which starts the dissolution of food) to the muscle movements of the esophagus (which pull food into the intestines) to the release of bile by the gallbladder (which breaks down food), digestion is an intricate process. Because there are so many organs and functions involved in digestion, the process can easily be disrupted, especially if you don't get enough of the vitamins and minerals that are necessary to support those organs and their functions. The enzymes, acids, and excretions that are needed for digestion to be performed properly are only produced when adequate amounts of the nutrients they depend on are provided in the diet. Since most people find it difficult to adhere to a squeaky-clean diet of whole fruits, vegetables, lean meats, and grains to ensure maximum nutrient availability, you will be happy to discover that turmeric can help.

With turmeric's assortment of fibre,

vitamins, minerals, antioxidants, and anti-inflammatory compounds, it can deliver the precise nutrition the digestive system needs to support enzymatic reactions, acid production, muscle movement, and optimal nutrient absorption. Just add 1 tablespoon of grated, powdered, or liquid turmeric extract to one of your dishes every day. All of turmeric's benefits combine to create the perfect digestive system elements that promote optimal (and regular!) digestion each and every day!

Ultra-high quality, high-potency organic Turmeric (Curcumin) extract combined with black pepper for increased absorption and bioavailability. Free from preservatives, artificial colorings, soy or stearates.

7. Promotes Fat Loss

The body requires specific nutrients to perform each function involved in fat burning. These functions include:

- + Increasing metabolism (improving calorie burn)
- + Regulating blood sugar levels and minimizing insulin resistance
- + Regulating hormone production and levels (ensuring cortisol and other fat-retaining hormones are kept in check)
- + Improving the communication between the digestive system and the brain via neurotransmitters to ensure feelings of satiety are experienced appropriately

If you add turmeric to your daily diet, whether it's a turmeric supplement that contains curcumin or powdered turmeric root, the essentials required for each of these processes are delivered to the proper organs via the bloodstream, promoting the successful functioning of each system.

When each system is optimized, you'll find that your:

- + Food is properly digested

- + Bile production is balanced
- + Energy levels are higher
- + Feelings of fullness come easier
- + Calorie-burn rates are higher

All of these benefits lead to increased fat burn,

Turmeric tastes great in teas, smoothies, snacks, and meals, so it's a very versatile and delicious ingredient that can maximize flavour and fuel fat burn. So, if you're hoping to lose fat without the pills, potions, and products that promise but don't deliver, opt instead for the natural doses of turmeric and its associated health benefits that can help you lose fat fast and healthfully!

8. Cleanses the Liver

Your liver is tasked with the difficult job of cleansing your body's fluids of toxins, pollutants, and irritants. The liver therefore plays a major role in maintaining the body's immunity and its ability to fight infection and preserve overall health. If the liver itself is compromised with toxins derived from the diet, environment, or lifestyle choices, it functions poorly, and that can lead to catastrophic consequences that can adversely affect your body and mind.

9. Can Help Prevent Alzheimer's Disease

A disease that affects an estimated 44 million people worldwide, Alzheimer's has a devastating effect on the human body. Alzheimer's halts working neurons, eats away at existing brain tissue, and wreaks havoc on the entire nervous system.

Turmeric allows the potent phytochemical curcumin to be absorbed in the blood and delivered directly to the sites of the brain in need. Not only does curcumin fight inflammation and infection, this phytochemical combats protein deposits and nervous system inhibition by excavating these potentially hazardous protein deposits that contribute to the brain degradation associated with Alzheimer's disease. With a simple teaspoon of turmeric root per day, grated fresh or in powdered form, mixed into meals, smoothies, or a simple elixir, you can help combat Alzheimer's disease naturally and deliciously.

10. Manages Arthritis Pain

Arthritis is pain and inflammation that occurs within the joints. All while delivering essential nutrients to improve the physical functions that help restore and replenish the health of joints throughout the body, turmeric extract might enable arthritis sufferers to enjoy a life without the condition and its limitations—naturally!

TURMERIC FARMING.

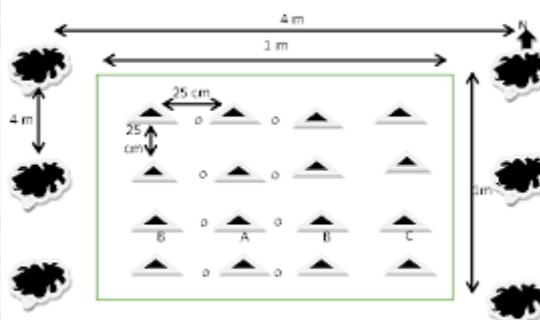


Planting for Turmeric Farming or Cultivation:

Whole or split mother rhizomes are used for planting and well developed healthy and disease free rhizomes are to be selected. Small pits are made with a hand hoe in the beds in rows with spacing of **25 cm x 30 cm** and covered with soil or dry powdered cattle manure.



The optimum spacing in furrows and ridges is between **45-60 cm** between the rows and **25 cm** between the plants. A seed rate of **2,500 kg** of rhizomes is required for planting one hectare of turmeric.



Climatic Condition for Turmeric Farming:

Turmeric is a tropical herb and is grown in both tropics and subtropics.

It will grow luxuriantly in shade if not too dense, but it produces larger and better rhizomes in the open ground exposed to the sun. Turmeric require humid climate.

Suitable Soil for Turmeric Farming:

Soils for Turmeric cultivation should be rich and friable. Soils with a **little higher sand content (Loams and sandy loams)** are well suited. It is grown in different types of soils from **light black, sandy loam and red soils to clay loams**.

It grows on light black, ashy loam and red soils to stiff loams in irrigated and rain fed areas.

LAND PREPARATION FOR TURMERIC FARMING :

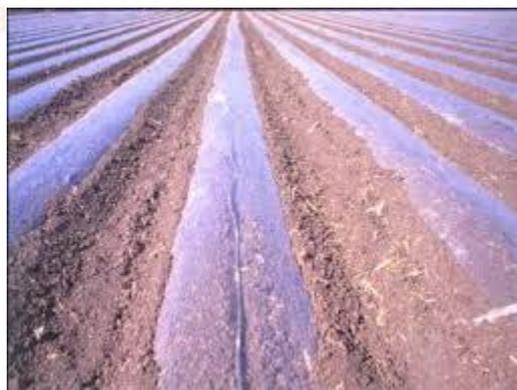
In Turmeric Farming, while preparing the land, minimum tillage operations may be adopted. Beds of **15 cm height, 1 m** width and of convenient length may be prepared giving at least **50 cm** spacing between beds.

In the case of the irrigated crop, ridges and furrows are prepared and the rhizomes are planted in shallow pits on the top of the ridges. Spacing generally adopted is **45-60 cm** between the ridges and **15-20 cm** between the plants.



Solarisation of beds is beneficial in checking the multiplication of pests and diseases causing organisms. The polythene sheets used for soil solarisation should be kept away safely after the work is completed.

Solarisation of beds



Plantation Time for Turmeric Farming:

Planting season varies with the area of cultivation and variety. Planting is done during May-June or July- August in different tracts. Turmeric can be rotated with crops such as Finger millet, Rice and Sugarcane. It is rarely cultivated in pure stand, but is usually grown mixed with crops like Castor, Maize, and Finger millet, Onions, Brinjal and Tomato.

Planting material in Turmeric Farming:

In Turmeric Farming, carefully preserved seed rhizomes free from pests and diseases which are collected from organically cultivated farms should be used for planting. However, to begin with seed material from high yielding local varieties may be used in the absence of organically produced seeds. For sowing, both the mother – rhizomes and fingers are used. The fingers are cut into **4 – 5 cm** long pieces, and the mother rhizomes are planted as such or split into two; each having at least one sound bud. The seed is sometimes sprouted under moist straw before sowing.



Irrigation or water supply for Turmeric Farming:

For turmeric number of irrigations will depend upon the soil and climatic conditions.

Depending upon the soils and rainfall **15 to 25 irrigations** are given in medium heavy soils and in case of light textured red soils **35-40** irrigations are needed.

Crop Rotation for Turmeric Farming:

Turmeric is grown in rotation with sugar cane, chilli, onion, garlic, elephant foot yam, vegetables, pulses, wheat and maize. It is cultivated as a subsidiary crop to ginger in some areas and in other areas with chilli and quick-growing vegetables.

Manures and Fertilization in Turmeric Farming:

Mostly for good crop and maximum output the farmers are using natural fertilizers, animal dung's, and avoid using chemicals or other harmful pesticides.



Turmeric needs heavy manuring. Application of well rotten cow dung or compost from own farm @2-3 tonne /acre may be given as basal dose while planting rhizomes in the pits. In addition, application of neem cake @ 0.8 tonnes/ acre is also desirable.

Pests and Disease Control in Turmeric Farming:

If **shoot borer** incidence is noticed, such shoots may be cut open and larve picked out and destroyed. If necessary neem oil 0.5% may be sprayed at fortnightly intervals.



No major disease is noticed in turmeric.

Leaf spot and leaf blotch can be controlled by restricted use of Bordeaux mixture 1%. Application of Trichoderma at the time of planting can check the incidence of rhizome rot.

HARVESTING TURMERIC:



Turmeric harvesting.



Usually harvesting extends from January to March-April. Early varieties mature in **7-8 months and medium varieties in 8-9 months**. The crop is ready for harvesting when the leaves turn yellow and start drying up.

At the time of maturity, leaves are cut close to the ground, the land is ploughed and rhizomes are gathered by hand-picking or the clumps are carefully lifted with a spade.

The picked rhizomes are collected and cleaned. The mother and finger rhizomes are separated before curing.



Harvesting is done by either manually or by mechanical.

Curing, Boiling & Drying of Turmeric Fingers:

Turmeric finger boiling.

Curing involves boiling of fresh rhizomes in water and drying in the sun. The objective of boiling is to destroy the viability of the fresh rhizomes and to obviate the raw odour, to reduce the drying time, to gelatinize the starch for hardening the rhizomes and give a more uniform colored product and an even distribution of colour in the rhizome.

In the traditional methods, the cleaned rhizomes are boiled in copper or galvanized iron or earthen vessels, with water just enough to soak them. Boiling process should be done over a slow fire until they softened.

Boiling is stopped when froth comes out and white fumes appear giving out a typical odour when properly cooked, the rhizomes would be soft and yield when pressed between fingers. The boiling lasts for **45 to 60 minutes** when the rhizomes are soft. Over cooking spoils the colour of final product while under cooking renders the dried product brittle.

Turmeric drying.



The cooking of turmeric is to be done within two or three days after harvesting.

The mother rhizomes and the fingers are generally cured separately.

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The cooked fingers are dried in the sun by spreading 5 to 7 cm thick layers on bamboo mat or drying floor.



A thinner layer is not desirable, as the colour of the dried product may be adversely affected. It may take 10 to 15 days for the rhizomes to become completely dry. The yield of the dry product varies from 20 to 30 percent depending upon the variety and the location where the crop is grown.

Preservation of Turmeric seed:

Rhizomes for seed are generally heaped under the shade of trees or in well-ventilated sheds and covered with turmeric leaves. Sometimes, the heap is plastered over with earth mixed with cow dung. The seed rhizomes can also be stored in pits with sawdust. The pits can be covered with wooden planks with one or two holes for aeration.

Yield of Turmeric:



Ready to Market Turmeric.

The yield of pure crop varies from **8,000 to 10,000** kg per acre. Under exceptionally favourable conditions, viz. abundant manuring and copious irrigation it may be as high as **12,000 kg** per acre.



GARLIC EMPIRE
AGRI-BUSINESS & MODERN FARMING

AFTER HARVESTING ALL THREE CROPS; **GARLIC, GINGER AND TURMERIC** ARE VALUE ADDED FOR FARMER TO EARN MORE PROFIT MARGIN.

THIS BOOK HAS BEEN PREPARED BY: **JAMES MUNGA KAMAU**

THE DIRECTOR OF: PASCAL LOGISTIC INTERNATIONAL.

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NOTE: THE WATERING SCHEDULE FOR GARLIC IS ATTACHED.

THANK YOU FOR TAKING BOLD STEP IN FARMING THESE LUCRATIVE AND SMART FARMING

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