



TOZER SEEDS

www.tozerseeds.com

CALIENTE MUSTARD

**For green manure
and bio fumigation**





About Us

Tozer Seeds is an independent British vegetable breeding company, founded in 1939. Initially a local company, by the 1970's Tozer Seeds was supplying seed to commercial growers across the UK. Today we have offices in Spain and in the USA, and our seed is sold and grown across the globe through our network of distributors.

Vision

We aim to provide consistent quality of seed and services whilst continuing the company tradition of innovation within plant breeding. We strive to ensure that all our seed we produce is of the highest germination and that it is healthy and pure.

As an independent company we are able to work very closely with our customers to provide the vegetable varieties they require in a continuously changing marketplace. We aim to develop strong relationships with customers, suppliers and other partners throughout the supply chain.

Vegetable Seed Expertise

We have been breeding award winning varieties for over 74 years. We maintain a large product assortment ranging from exciting niche varieties to internationally grown market leaders. Our staff are knowledgeable, passionate and committed, our product development team carry out product variety trials around the world in order to build up an extensive knowledge and understanding of our products and their capabilities.

Future

Whilst our business continues to develop in areas across the globe, Tozer Seeds remains an independent vegetable seed breeder and supplier. Emphasis lies on developing new and innovative products with excellent field performance together with distinct characteristics such as improved flavour, to enable growers to produce crops of the highest quality.

Why Green Manure?

The incorporation of green plant tissue into the soil is an ancient practice known as 'green manuring'. As well as being an economical and practical method of restoring productivity to idle or overworked land, Caliente Mustard green manures have additional advantages:

- Improves soil fertility and structure
- Adds nutrients and organic matter
- Improves soil aeration
- Increases water infiltration and holding capacity
- Reduces soil erosion from wind and water
- Increases soil biodiversity by stimulating the growth of beneficial microbes and other soil organisms
- Ideal for use in organic crop rotations and in conventional systems where ICM and reduced risk inputs are favoured
- Measurable yield increases in following crops.

The Biofumigation Process

Biofumigation refers to the suppression of soil borne pests and pathogens by naturally occurring compounds, predominantly isothiocyanate (ITC) released from Brassicaceous plant tissues. When these plant tissues are damaged, glucosinolates and a particular enzyme (Myrosinase) present in plant cells are allowed to come together, and in the presence of water produce ITC.

Caliente Mustards and Nemat are not simple green manure crops. They have been bred specifically to produce large quantities of biomass and contain high levels of the specific desirable glucosinolates and enzymes required for the biofumigation process.

All our varieties are protected by plant breeders' rights.



Benefits to Potato and Root Crops

- Improvements to soil health from green manure effect
- May improve skin finish on potatoes and deter wireworm populations

Suppression of:

- Weeds
- Range of nematodes (including cyst, root knot and free living species)
- Range of soil-borne pathogens (including *Verticillium dahliae*, *Rhizoctonia* spp., *Pythium* spp., *Fusarium* spp., and *Sclerotinia* spp.)

Benefits to Soft and Cane Fruit Crops

- Improvements to soil health from green manure effect
- Provides a good source of nutrients to following crop, particularly nitrogen
- Encourages improved root system and penetration

Suppression of:

- Weeds
- Range of soil-borne pathogens (including *Verticillium dahliae*, *Fusarium* spp., and others)
- Range of nematode species

Benefits to Vegetable and Salad Crops

- Improvements to soil health from green manure effect
- Provides a good source of nutrients to following crop, particularly nitrogen
- Offers significant reduction in weeding costs, in terms of subsequent herbicide applications, and/or labour for hand/mechanical weeding. A particularly important benefit for organic systems

Suppression of:

- Weeds
- Range of soil-borne pathogens including *Pythium* spp., *Sclerotinia* spp., *Fusarium* spp., *Rhizoctonia* spp., and others)
- Range of nematode species

Other Applications

Caliente Mustards and Nemat are suitable for a wide range of other applications, including:

- Before replanting top fruit
- Forestry and tree production
- Protected cropping (soil grown)
- Ornamentals and hardy nursery stock (soil grown)
- Cut flower production
- Bulb production
- Viticulture (wine and table grapes)

Caliente Mustard Products

There are a range of varieties available to suit different climatic conditions, crop pests and cropping programmes.

Caliente Mustard 199

Hottest variety, giving the best biofumigant action due to very high levels of glucosinolates (30% more ITC than our previous basis Blend 119).

Requires good growing conditions.

Fertiliser inputs and irrigation are essential for best results from this variety.

Recommended seeding rate: 8-10 kg/ha.*

Caliente Mustard 61

Large leaved variety producing high levels of biomass.

Longest season and slowest to flower of all our mustard brands.

Temperature sensitive, requires warmth.

Suitable for mid-summer sowings (UK).

Best variety for warmer climates (e.g. Spain, Portugal).

Requires irrigation where soil moisture is low.

Recommended seeding rate: 6-8 kg/ha.*

Nemat (*Eruca sativa*)

Trap crop for various nematodes, including some root knot and cyst species.

Plant roots contain highest levels of glucosinolates.

Dense foliage produces good biomass, although crop is shorter in height than mustard varieties.

Mowing crop before flowering can extend growing season and increase nematode trapping time.

Tolerant to a range of high and low temperatures, frost tolerant.

Relatively drought resistant once established.

White flowered.

Recommended seeding rate: 6-8 kg/ha.*

* Seed rates depend on sowing method and seed bed condition. Use the lower recommended seed rate when direct drilling using a precision drill into a good seed bed. Use the higher rate if broadcasting then harrowing and/or rolling the seed into cereal stubbles or poor seed beds.

Crop Protocol

Successful biofumigation and green manuring from Caliente Mustards requires a number of inputs, which will be repaid in following crops. Failure to treat Caliente Mustards as a 'crop' may result in disappointment.

Seed placement

A reasonable seed bed is required, maximum seeding depth 5-10 mm.

Seed should be shallow drilled and rolled, or broadcast (shallow harrowed) and rolled.

Seed can be broadcast into cereal stubbles, rolling will improve germination.

Fixed beds - reduce seeding rate/ha to take account for wheelings.

Timing

Crops grown on non-irrigated land should be timed to coincide with normal weather patterns, sow early or late in the year (UK) to take advantage of residual soil moisture, although crops will respond to irrigation during dry periods.

Summer sown crops (May, June, and July in UK) will require irrigation throughout all crop stages to supplement rainfall.

Overwintering of crops is possible, especially in south UK and warmer climates. Successful crops must be sown late, no earlier than early-mid October (UK) depending on conditions.

Irrigation

Soil moisture is essential at sowing and to establish the crop; lack of water will lead to premature flowering and reduced biomass production. The biofumigation reaction will only occur in the presence of water.

Where irrigation is available, ensure crop is watered throughout germination and establishment, and as required to keep soil moist.

Fertilizer

For maximum biomass production Caliente Mustard crops require 120-140 kg/ha nitrogen, depending on soil type and previous cropping. Up to 90% of this nitrogen will be recycled and made available to following crops.

Apply entire quantity of N at or immediately after sowing, except for overwintered crops where applications should be split into two; at sowing, and once growth restarts in early spring.

Sulphur levels vary greatly by soil and geography, but as a guide Caliente Mustard crops require 20 kg S, for maximum glucosinolate production.

Organic growers may experience reduced biomass due to restricted fertilizer inputs, however good crops can still be achieved on fertile soil.

Incorporation

Time to crop maturity will vary with time of year and climatic conditions, but generally ranges from 60-100 days for a spring to late summer sown crop. Overwintered crops will take significantly longer.

At maturity vertical growth will stop, and if grown to full potential will achieve a height of approx 100-150 cm, producing 50-100 t/ha biomass (fresh weight), of which 15-20% constitutes dry matter.

Aim to incorporate crop up to 2 weeks after first bloom for maximum biofumigation effect.

Chop the crop using a flail mower with hammer blades for maximum cell destruction, immediately followed by cultivation equipment to incorporate to a depth no greater than 15cm, producing a fine tilth and rolled to seal the surface, trapping the ITC gas.

In 20 minutes 80% of the ITC gas will be lost - it is therefore essential to incorporate the crop as quickly as possible after chopping. Use two pieces of equipment that closely follow each other, or large machinery that allows for one pass.

Soil moisture at incorporation is essential for biofumigation, either irrigate or incorporate after rain.

Beds can be formed at incorporation if required, and polythene laid if necessary for the following crop.

Post Incorporation

Leave for 14 days, and ideally perform a cress test before drilling or planting subsequent crop.

Crops grown as soon as possible after 14 day period will gain greatest benefit from the weed suppression effect.

Avoid ploughing and excessive cultivation before the following crop, subsequent cultivations should remain within the incorporated depth.

All varieties are soft seeded and should not pose a volunteer problem providing seed is not allowed to ripen.

As a guide, after first bloom, seed ripening takes 28-42 days. Any ripened seeds that do self-sow will germinate in one flush, enabling easy control by mechanical or chemical methods.

The ability of Caliente Mustards to reduce pest pressure and improve soil quality will vary with soil type, management technique, production timing and existing pest pressure. We recommend that growers evaluate their own situation before relying solely on these products for pest control.



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