



Calcium Cyanamide

Use in vegetables

What is calcium cyanamide?

Calcium cyanamide, also known as nitrolime, has been used as slow release nitrogen / calcium fertiliser with liming effect for over 100 years. Because of its negative effect on many soil borne diseases it is now often applied to prevent yield and quality losses during increasingly tight crop rotations.

What effect does calcium cyanamide have?

Effect on soil borne diseases

Calcium cyanamide when used as a fertiliser, offers good control of clubroot and some species of Phytophthora. Other organisms causing soil borne diseases may also be affected. Recent trials in carrots have shown a decline in levels of *Pythium sulcatum*. Research has shown large differences in sensitivity of soil borne pathogens to calcium cyanamide, therefore it cannot be considered a soil fumigant. A soil fumigant is a product that has a broad spectrum, destructive effect on soil life, including pathogens and on germinating seeds, including weeds.



Image 1: Calcium cyanamide provides control of soil-borne diseases, newly germinated weeds, and assists with residue breakdown when applied as a fertiliser

Effect on weeds

The herbicide action of calcium cyanamide acts only in the top 3–4 cm of the soil. This means it mainly affects newly germinated weed seedlings and small weeds up to the 4-leaf stage.

Weed seeds deeper in the soil, or weeds propagated by rhizomes, are not adequately controlled.

Breakdown of crop residues

Calcium cyanamide can be used to accelerate the breakdown of crop residues because it supplies nitrogen and has a liming effect. The sanitising effect helps by suppressing weeds and diseases. In Europe, calcium cyanamide is used in the manufacture of compost.

How calcium cyanamide works

A few hours after being applied to the soil, the soil water reacts with calcium cyanamide to form calcium dihydroxide and hydrogen cyanamide (not cyanide). Hydrogen cyanamide is toxic to plants, and has strong

Key messages

Calcium cyanamide can be used:

- As a non acidifying, slow release nitrogen fertiliser
- To reduce soil borne disease pressure
- To suppress weed germination
- As an additive to compost

This fact sheet explains how the product works, how to use it in vegetables and how to handle and store it safely. Ask your agronomist about sourcing calcium cyanamide products.



Calcium Cyanamide use in vegetables

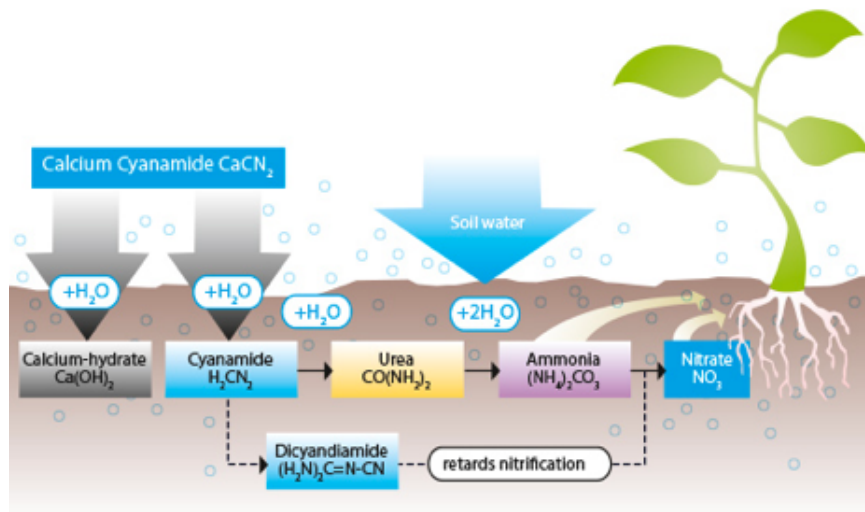


Figure 1: An illustration of calcium cyanamide's reactions within the soil. (Image by MagentaGreen - Own work, CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=36425001>)

fungicidal properties. It can inhibit the growth and sporulation of pathogenic fungi, and unlike cyanide, it does not form poisonous gases in the presence of moisture.

Hydrogen cyanamide is completely converted to urea in 7–14 days and, to a certain extent, to dicyandiamide, which is a nitrification inhibitor. Urea in the soil is further converted to ammonium, however the dicyandiamide hinders further breakdown of ammonium to nitrate.

The calcium dihydroxide has a liming effect, and this leads to an accumulation of ammonium nitrogen in the soil before the ammonium can be adsorbed by clay minerals, temporarily immobilised by soil microflora or taken up by plants. In other words, calcium cyanamide is also a slow release form of nitrogen for the crop, and is eventually converted to nitrate.

Use in vegetable crops

Brassica Crops

Table 1: Clubroot infested areas

WHEN TO APPLY	APPLICATION RATE (KG/HA)	IMPORTANT NOTES
Two weeks before sowing or transplanting; to be repeated if necessary	400 - 500	Work into the soil with discs or a power harrow
Two to three weeks after sowing or transplanting	400 - 500*	Only on well-established brassica plants or sown brassica 10 to 15cm high, foliage must be dry (no dew!)

Table 2: Clubroot-free areas

WHEN TO APPLY	APPLICATION RATE (KG/HA)	IMPORTANT NOTES
2-3 weeks after planting	400 - 500*	Side-dress when plants are dry; the soil should be moist

* with cauliflower not more than 300 kg/ha, with Chinese cabbage no top dressing.

Calcium Cyanamide use in vegetables

Leeks

Table 3: Direct seeded

WHEN TO APPLY	APPLICATION RATE (KG/HA)	IMPORTANT NOTES
Application before seeding	300 - 350	Observe waiting period of 8-14 days

Table 4: Transplanted

WHEN TO APPLY	APPLICATION RATE (KG/HA)	IMPORTANT NOTES
Before planting	300 - 350	Observe waiting period of 8-14 days; possibly work into the soil to a shallow depth
Top dressing	300 - 400	Approximately 14 days after planting ; calcium cyanamide grains should not be allowed to contact the roots at transplanting. When using row application equipment, calcium cyanamide can also be applied later.

Lettuce

Table 5: Lettuce application

WHEN TO APPLY	APPLICATION RATE (KG/HA)	IMPORTANT NOTES
Before planting	300 - 350	Observe the following waiting periods: in spring: 2 - 2.5 weeks in summer: 1 - 1.5 weeks

Asparagus

Spread on moist soil and on dry plants. Always spread **before** leaflets have formed.

Table 6: In the first year after planting

WHEN TO APPLY	APPLICATION RATE (KG/HA)	IMPORTANT NOTES
Crop stage: between planting and emerging	200	Use a harrow to flatten off the steep slopes of the beds into gentle waves
Crop stage: plants that are one hand high, before they branch out	200	Spread on dry plants but the soil should be moist

Calcium Cyanamide use in vegetables

Table 7: In the second year after planting

WHEN TO APPLY	APPLICATION RATE (KG/HA)	IMPORTANT NOTES
After ploughing	300 - 500	Weeds should be growing but not beyond the 4-leaf stage, because in this stage they are particularly sensitive

Table 8: In the third year after planting and beyond

WHEN TO APPLY	APPLICATION RATE (KG/HA)	IMPORTANT NOTES
After ploughing	300 - 350	Weeds should be growing but not beyond the 4-leaf stage, because in this stage they are not sensitive

Other crops

Table 9: Calcium Cyanamide application to other crops

CROP	APPLICATION RATE (KG/HA)	WHEN TO USE
Peas	200 - 300	1 - 2 weeks before sowing or in the period from when the tips break through until the plant is approx. 10cm tall
Broad Beans	200 - 300	1 - 2 weeks before sowing or after sowing until shortly before the plants emerge;
Bush Beans	300 - 400	Before plants emerge;
Carrots	300 - 400	2 - 3 weeks before sowing;
Spinach	300 - 400	2 - 3 weeks before sowing;
Radishes	300 - 500	2 - 3 weeks before sowing;
Cucumbers	300 - 500	2 - 3 weeks before laying or planting;
Celery	300 - 500	3 weeks before planting;
Tomatoes	300 - 500	3 weeks before planting;
Rhubarb	300 - 500	Before sprouting in spring;

Calcium Cyanamide use in vegetables



Image 2: To ensure the efficacy of calcium cyanamide, make sure that you follow the guidelines specific to the crop that you are growing

General application rules

Table 10: Application guide

ITEM	RECOMMENDATIONS
Soil moisture at application	Conversion from calcium cyanamide to urea and then ammonium will only happen when soil conditions are moist i.e. just below or at field capacity
Incorporation depth and method	Normal cultivation depth, can be applied to the top of soil but then nitrogen losses may occur and the effect on diseases and weeds lessened
Conversion and withholding time before seeding & impact of soil organic matter	<p>Conversion usually takes: 2–3 days per 100 kg/ha</p> <p>6–9 days for 300 kg/ha Calcium cyanamide</p> <p>8–12 days for 400 kg/ha Calcium cyanamide</p> <p>10–15 days for 500 kg/ha Calcium cyanamide</p> <p>Use longer withholding periods in light soils, especially if organic matter levels are low</p>
Soil moisture after application	Soil must be kept moist to incorporation depth during the conversion time. If the crop is sown after more days than it takes to convert it (e.g. 2 weeks), keep soil moist for the duration of conversion only
Adjacent crop safety	If there are crops close by that are in a sensitive development stage (e.g. establishment to 5-leaf for carrots), then ensure the crop does not get covered by calcium cyanamide dust



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ITEM	RECOMMENDATIONS
Adjust the N fertiliser program	<p>As with any nitrogen fertiliser, the application rate of calcium cyanamide may depend on the nitrogen requirements of the crop and the nitrogen supply from the soil (residual N from crops or cover crops and mineralisation from organic matter).</p> <p>Calcium cyanamide contains 19.8 % N:</p> <p>An application of 300 kg/ha supplies 59.4 kg N/ha</p> <p>500 kg/ha supply 99 kg N/ha.</p>
Adjust liming	Calcium cyanamide has a liming effect – refer to the liming value table below
Environmental	Even where chemical pesticides must be omitted in part or entirely, calcium cyanamide may still be used to take advantage of its phytosanitary effects in addition to its effect as fertiliser. In light soils, N may be washed through the root zone – monitoring is recommended.
Health and safety	Breathing protection with a fine particle filter must be worn and other precautions applied as per the manufacturers MSDS

Properties

Table 11: Chemical properties

CHEMICAL PROPERTIES	CALCIUM CYANAMIDE
Total nitrogen	19.8%
Nitrate nitrogen	1.8%
Cyanamide nitrogen	>15%
Dicyandiamide nitrogen	approx. 0.5%
Neutralising value (CAO)	>50%

Table 12: Physical properties

PHYSICAL PROPERTIES	CALCIUM CYANAMIDE
Appearance and composition	Grey-black granulate
Pouring density	1000 kg/m ³
Grain size	0.8 - 3.5 mm

Liming value

The so-called liming value specifies the effect of a nitrogen fertiliser on the lime balance of a soil. If a fertiliser provides more lime than is required to neutralise the acids that are produced when nitrogen is converted in the soil, its lime value is positive. In the opposite case its lime value is negative, which means it reduces the soil's pH.

Table 13: Liming values of various nitrogen fertilisers including calcium cyanamide

FERTILISER	LIMING VALUE (KG CaO)	
	PER 100 KG CALCIUM CYANAMIDE	PER 100 KG N
Calcium cyanamide 19.8% N	+ 30	+ 152
CAN calcium ammonium nitrate, 27% N	- 16	- 58
Urea 46% N	- 46	- 100
NPK, e.g. 13-13-21	- 13	- 100
Ammonium sulphate nitrate	- 51	- 196
DAP 18-46	- 37	- 205
Ammonium sulphate 21%	- 63	- 300

Mixing

Calcium cyanamide can be mixed with other products, but note the following:

- Do not mix it with fertilisers containing ammonium nitrate! This could set off chemical reactions that could make the mixture greasy and result in ammonia loss
- All mixtures should always be stored dry! Cover loose goods with a tarpaulin
- Mixtures with hygroscopic-acting fertilisers should be spread as quickly as possible to avoid lumping
- To ensure an even distribution when spreading a mixture make sure that the mixture components have roughly the same grain sizes and specific gravities

Storage

- Calcium cyanamide must be stored dry and protected from damp in a clean area
- Do not store it together with highly flammable and combustible materials and substances
- Store it separately away from fertilisers containing nitrates, and away from substances that are acid and alkaline
- Calcium cyanamide (ground) may only be stored together with ammonium- and ammonium nitrate-containing fertilisers when it is adequately separated from them. Adequately separated means:
 - A minimum distance of 5m when stored loose outdoors
 - A minimum distance of 2.5m when stored loose in a storage room
 - A minimum distance of 1m for packaged products in a storage room (non-reactive substances can be stored in between)
- With loose calcium cyanamide and packaged calcium cyanamide there are no material-related storage problems since the product does not corrode wood, concrete, plastics or steel
- When storing in flat stores the usual precautions for loose storage of mineral fertilisers should be observed (cover with PE film)
- Storage in tower silos is straightforward; as long as damp is prevented from getting in, there should be no bridging and caking
- Transport and interim storage in sloped-bottom containers is also straightforward