The product: nicarbazin

Nicarbazin for controlling the number of urban pigeons is marketed with maize grain and covered over with an edible silicon layer so the nicarbazin stays on the maize even when it is handled or gets wet.

Composition of the product per every 100 g

PRODUCT

Active ingredient:
0,080 g
Nicarbazin

Other components:
5,000 g
Stearic acid
0,100 g
BHT
93,820 g
Maize grain

Water repellent polymer:
1,000 g
Dimethicone MPH

Nicarbazin is included in the carbanilide group belonging to anticoccidials. It is an equimolecular complex of 4,4'-dinitrocarbanilide (DNC) and 2-hydroxy-4,6-dimethylpyrimidine (HDP).

Nicarbazin ($C_{19}H_{18}N_6O_6$)

This is a flavourless, odourless, pale yellow powder that is insoluble in water but dissolves in alcohol and some organic solvents.

When pigeons ingest nicarbazin, they metabolise it quickly, unlike progesterone, and it breaks up into two components, DCN, the active part, and HDP, which enables its absorption into bird intestines.

When it is not in complex with HDP, the DNC aggregates form particles that are too large for absorption into the intestine, hence the inability of organisms to assimilate DNC. This also happens when nicarbazin dissolves in water or goes to the surface of the ground.

Effects of nicarbazin on the reproductive functions of pigeons

Studies carried out from administering nicarbazin to urban pigeons have shown that **it is not toxic to these birds**.

It has also been confirmed that **it has a reversible effect on the birds' reproduction** (once it stops being administered, the pigeons are able to breed again).

Nicarbazin is noted for having **little toxicity on a systemic level**. Even so, this compound causes a hormonal imbalance which has a very serious effect on their egg production (reduced laying) and quality: their eggs end up lighter, with thinner shells and speckled yokes.

White spots also appear, due to the leakage of liquid from the albumen (white of the egg) into the yoke, as the latter's membrane becomes increasingly permeable.

The rupturing of the yoke's membrane causes it to mix with the albumen, changing the conditions needed for the embryo's viable development.

Toxicity and side effects in other species

Nicarbazin can only have a sterilising effect if it is continually ingested and at a certain daily dose (10 grammes a day per pigeon).

Studies on toxicity in mammals and birds receiving short- and long-term doses of nicarbazin have shown minimal effects. Adverse effects in animals have generally been observed only after a year or more of treatment, which would not apply here as the treatment lasts approximately 8 months.

Birds

When it comes to granivorous birds, the calibre of the maize grain prevents it from being ingested by species that are smaller than pigeons, such as sparrows.

As for birds that are the same size as pigeons, by adapting doses to the number of pigeons in a place, the latter's voracity and aggressiveness only allow the occasional ingestion of the product by other species, which would result in de-infestation of coccidia rather than sterilisation.

These species in any case have a period of reproduction limited to a couple of months, during which, where a risk is confirmed, the pigeons' treatment may be temporarily interrupted.

Birds of prey

There is no risk to birds or prey in feeding on pigeons treated with nicarbazin.

When pigeons ingest nicarbazin, they metabolise it quickly and it breaks up into two components, DCN, the active part, and HDP, which enables its absorption into bird intestines. So, **when a bird of prey eats a pigeon treated with nicarbazin, it ingests the broken-up, inactive form of that product, which cannot be absorbed**. Even then, the inactive nicarbazin residues that it can consume are insignificant, given the low quantity that remains in the pigeon's tissues and organs.

The following concentrations of nicarbazin are found in pigeons treated with the product:

Pigeon part	Nicarbazin concentration
Muscle, 50 g	0,11 mg
Egg	0,15 mg
Skin and fat, 30 g	0,054 mg
Liver, 20 g	0,14 mg

A bird-eating predator would therefore consume 0.30-0.45 mg of nicarbazin, a dose that is 20 times less than the minimum required for having any effect.

Mammals

Studies from the World Health Organisation (WHO) suggest that mammals (including humans) would have to consume enormously high quantities of the product for it to have toxic effects on them.

According to the EPA (the US Environment Protection Agency), based on acute oral toxicity data on rat LD50 values and for the American product (2500 ppm) with a concentration of nicarbazin three times higher than the European product's (800ppm), a single acute ingestion for a child (15 kg p.v.) would have to exceed 60 kg of the product and for a dog (10 kg p.v.) 40 kg of the product before it could cause a lethal effect on 50% of the population that consumes it.

So, **the product used in Barcelona only has toxic effects based on 12 kg of product for every kg of weight** of the mammal. As a result, daily consumption of the product is impossible, as is ingesting a dangerous quantity.

Environmental impact

The drug's environmental impact has been evaluated on the bases of its drug and metabolites in faeces.

The quantity of nicarbazin and its metabolites excreted into the environment by a population of pigeons treated with the stated dose proves to be 100 times less than the limit provided for under current European regulations on “Environmental Risk Assessment (E.R.A.)”, which sets this limit for this substance at 10µg per kg of earth.

Persistence in the environment is limited, owing to the product's sensitivity to ultraviolet rays and the break-up of its molecules.

Treating pigeons in individual cages has enabled excretions to be collected and analysed and the residual presence of nicarbazin to be assessed.

As a result of DDT and other pesticides that are harmful to birds and wildlife, the USA's Environmental Protection Agency (EPA) has taken a proactive position in reducing risks. Nicarbazin had to pass EPA controls, gaining approval in 2005, before it could be marketed for controlling Canadian geese and pigeon populations. The studies its approval was based on show that the effects on land and aquatic organisms are Practically Non-Toxic (the lowest category), even in larger concentrations than the ones used for controlling reproduction.