



Nonivamide (synthetic capsaicin) - A potentially fatal myth in pesticide world!



Aptly defined as the **pain producing component**, Nonivamide is a synthetic capsaicin belonging to the genus *Capsicum*.¹

Nonivamide is also called **pelargonic acid vanillylamide** or **PAVA** and is a capsaicinoid. It is present in chili peppers, but is commonly manufactured synthetically. The reddish brown, oily liquid obtained by extracting dried, ripe fruit of chili peppers is known as Oleoresin capsicum. More than 100 compounds have been identified in oleoresin capsicum, but capsaicin is the most pungent and particularly irritant component in many peppers comprising of 0.007% to 0.7% of dried mass.²

2 most unfortunate myths associated with this synthetic capsaicin are discussed in this article.

MYTH #1:

“Nonivamide can be used to deter pests”

Capsaicin compound is sold popularly as mammalian pests, bird and insect deterrents. A common example is the use of ground-up or crushed dried chili pods in birdseed to deter squirrels, since birds are unaffected by capsaicin. However, these solutions may be a realistic option for commercial applications.

Although hot chili pepper extract is commonly used as a component of household and garden insect repellent formulas, extensive studies show that it is not clear that the capsaicinoid elements of the extract are responsible for any repellency. Even if the effects are seen, they are only temporary.³

Infact, the matter of fact is that- Unlike many fruits, which have evolved to seed dispersal with the zoochory, the seeds of *Capsicum* plants are predominantly dispersed by birds themselves, in which capsaicin has an analgesic rather than irritant property! **Chili pepper seeds consumed by birds pass through the digestive tract unharmed, whereas those consumed by mammals do not**



germinate at all.

Most of the pests possess evolutionary advantages: Birds & mammals do not have the same sensitivity to capsaicin anymore, because it targets a specific pain receptor which is now immune to the hotness. Chili peppers are eaten by birds living in the chili peppers' natural range. The seeds of the peppers are distributed by the birds that drop the seeds while eating the pods, and the seeds pass through the digestive tract unharmed. This relationship may have promoted the evolution of the protective capsaicin. In the picture above, you can see a grey squirrel inside a chili ring of fire, eating the bird food.⁹

MYTH #2:

“Nonivamide is non-toxic and safe to humans”

Since capsaicin is universally used as self-defense and riot-control agent in form of pepper sprays, tear gas, etc, the notes and documents from various statutory bodies world-wide have been sadly misunderstood. In the summary report on Nonivamide by The European Agency for the Evaluation of Medicinal Products (Veterinary Medicines Evaluation Unit), a conclusion that Nonivamide has low oral toxicity and recommendation for use in topical treatment is given. Similarly, a Committee on Toxicology of Chemicals in Food, Consumer Products & the Environment has given a statement on the use of PAVA as an incapacitant spray. The report concludes that the available information, both from the toxicity data in experimental studies, and experience in use, indicates that the low exposures arising from the use of PAVA incapacitant spray would not be expected to be associated with any significant adverse health effects.

Capsaicin is almost non-toxic, as also highlighted by these reports. But the glitch here is that in food/ pharma applications the dosage of Nonivamide is not more than 1%. Most of the self defense or pepper sprays contains not more than 0.32% of capsaicin. **In large quantities, capsaicin can cause death.**⁵ Symptoms of overdose include difficulty breathing, blue skin, and convulsions. Eye exposure produces intense tearing, pain, conjunctivitis and blepharospasm.⁷



Acute toxicity values:

The lethal dose (LD50 in mice) of capsaicin is 47.2 mg/kg. According to WHO Recommended Classification of Pesticides by Hazard, this compound falls in Class 1b (5- 50 mg/kg rat) meaning a **“highly hazardous substance”**. (Refer WHO classification in table along). The label for such a substance is shown here.

R- and S-Phrases:

R-phrases (short for Risk Phrases) are defined in Annex III of European Union Directive 67/548/EEC: *Nature of special risks attributed to dangerous substances and preparations*. The list was consolidated and republished in Directive 2001/59/EC, where translations into other EU languages may be found. R-phrases for Capsaicin are:

R25 Toxic if swallowed;

R36 Irritating to eyes;

R37 Irrigating to respiratory system;

R38 Irritating to skin;

R41 Risk of serious damage to eyes;

R42/43 May cause sensitization by inhalation and skin contact.⁵

S-phrases are defined in Annex IV of European Union Directive 67/548/EEC: *Safety advice concerning dangerous substances and preparations*. The list was consolidated and republished in Directive 2001/59/EC, where translations into other EU languages may be found. S-phrases for Capsaicin are:

S22 Do not breathe dust;

S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S28- After contact with skin, wash immediately with plenty of water;

S36/37/39 Wear suitable protective clothing, gloves and eye/face protection.

S45 In case of accident or if you feel unwell; seek medical advice immediately (show the label where possible).

DOT Classification:

CLASS 6.1: Poisonous material

Identification: Toxic solid, organic, n.o.s. (capsaicin) UNNA: 2811 PG: III

Case Study:

Human Volunteer Studies were carried out by exposing volunteers to PAVA by inhalation to study the effects on the respiratory and cardiovascular systems. The aerosol was generated using a nebulizer to provide respiratory particles. Ten healthy subjects and ten mild asthmatic subjects were exposed to a range of concentrations. It was noted that under operational use with concentrations as low as 1.3%, the subjects would be likely to be

experiencing a high level of stress, and this could lead to clinically significant bronchospasm.⁸

Non- toxic and non- hazardous options in lieu of Nonivamide:

Unlike conventional rodenticides or termiticides, **Rodrepel™®** and **Termirepel™®** respectively “keeps away” the pests; and have been prepared by molecules simulated by advanced research which are **completely non toxic to humans as well as other animals**. They are completely free of insecticides, heavy metals or products such as copper or lead naphthenates, lindane etc or chemicals- natural/synthetic found dangerous or harmful to humans or animals. The products do not migrate or leach out from the polymer to contaminate ground water resources. The active life of these products is 15- 40 years depending upon application.

Rodrepel®™ and Termirepel®™ are available in form of masterbatch for ease of processing in polymer applications. The active ingredient is stable upto 1400 C. For more information, log onto www.rodrepel.com and www.termirepel.com.

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5. "Capsaicin Material Safety Data Sheet"(pdf). sciencelab.com. 2007
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