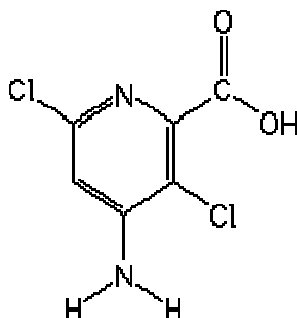


# Aminopyralid Contamination in Farmyard Manure

## A SCIENTIFIC APPROACH

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## **Introduction**

Aminopyralid (4-amino-3,6-dichloropyridine-2-carboxylic acid; CAS number 150114-71-9) is used as an active ingredient in herbicides for the control of broad-leaved weeds in grassland. The substance is approved for product in the UK on non-food crops only. Several products containing this active ingredient are manufactured by Dow Agrosiences, the most popular of which is Forefront. Most of these products are only licensed for professional use, although a non-professional product (Banish) for the spot-treatment of docks, thistles, buttercups, and ragwort by smallholders and horse owners was launched recently.<sup>1</sup>

All of these products carry clear warnings that the active ingredient (aminopyralid) has the ability to come through the digestive process of ruminants and be found at trace levels in slurry and manure. These trace levels may be enough to have an impact on sensitive crops.<sup>2</sup> For this reason, the manufacturer recommends that manure from animals fed on grass, hay, haylage, or silage that has been treated with any of these pesticides is not applied to sensitive crops nor supplied to public or horticultural end users.

The herbicide is primarily foliar acting (it acts on the leaves of the weed) but can also provide some residual weed control whereby it remains in the soil and prevents re-growth of the weeds. The active ingredient is quickly broken down when exposed to soil microbes but this process can take longer if it is bound to plant tissues.<sup>2</sup> This would include the lignin present in manure and compost: lignin is the least digestible part of a plant, both to animals and microbes.

Current data suggests that aminopyralid has low toxicity via oral, dermal and inhalation routes of exposure. Studies also suggest that the molecule is unlikely to cause mutagenic, teratogenic, or carcinogenic effects in humans and other animals.<sup>3</sup>

### ***Problems with Analysis***

In order to make an informed judgement on whether or not a manure or compost contains a significant amount of aminopyralid, two important pieces of information are required:

- The exact concentration of aminopyralid in the compost or manure; or
- The minimum concentration that can adversely affect plant growth of any given species.

To date, neither of these two vital pieces of information is readily available. Standard methods do exist for analysing aminopyralid in soil but as discussed previously, aminopyralid binds tightly to lignin, and as such is extremely difficult to extract from a sample. This means that reliable laboratory analysis of manure and compost samples can often be very time consuming and therefore expensive.

Even if an analysis were to be successful, without a robust threshold limit to compare the result to, it is impossible to say whether a plant could be affected; it is possible that some plant species may be inhibited at concentrations below the detection limit of the method.

## ***The Extent of the problem***

In the absence of a reliable analytical test and corresponding threshold level, the only evidence so far for aminopyralid contaminated manure is based purely on observations of one of the three situations:

- Failure of a seed/bulb to germinate (non-emergence);
- Failure of a plant to grow to its full potential (stunted growth); or
- Abnormalities of plant growth.

It is possible that other factors aside from aminopyralid contamination could be responsible for at least some of these observations. For example, high salt levels in an incorrectly applied straw-based manure could cause stunted growth and yellowing of the leaves.

Without a reliable method to determine whether aminopyralid is present in a compost or manure, it is extremely difficult to estimate the scale of the problem or to trace sources of contamination.

## ***The Way Forward***

Without question, further research and development is required to establish a rapid, selective, and sensitive analytical method for the analysis of aminopyralid in manure samples. A threshold limit also needs to be established and set for the maximum level permissible in a growing media. Users of products containing aminopyralid also need to be made more aware of the implications it has on their grass and grass products, Dow have had a publicity campaign in place for some time now with this aim.

All of these goals will take time to achieve; in the meantime with ever increasing fertiliser prices and a drive towards increased organic food production, home and professional growers alike still rely on manure-based products as fertilisers, mulches, and soil improvers.

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## Growing Trials

In order to categorically say whether a manure or compost has significant levels of a substance that affects plant growth, it is possible to conduct a scientifically controlled growing trial on it. Such trials compare the germination and development of a seeds planted in a growing media that incorporates the test substance with equivalent seeds planted in peat-based controls.<sup>4</sup>

Three quantities are reliably determined from this type of test:

- The number of seeds germinated;
- The average growth of the plants; and
- The presence or absence of any abnormal growth.

## Advantages of Growing trials

The trials provide a realistic, repeatable, and reliable test of whether or not a compost or manure will support healthy plant growth. Any substance present in the manure or compost which could significantly inhibit healthy growth will show up in the test. As no expensive chemicals and very little specialist equipment is required, costs are comparable to those of conventional laboratory analysis.

## Disadvantages of Growing Trials

The trial will not confirm the presence of any substance that does not affect plant growth, nor will it selectively identify any species that does affect plant growth. The trials should be considered as a screening method for all substances harmful to plants, and not as a test for one specific substance (eg. aminopyralid.) The test will not identify the presence of any materials that do not affect the test plant (usually tomatoes.) Due to the nature of the trials, they are also quite time consuming; results are issued 28-36 days from receipt of the samples.

## **Conclusions**

There is a strong possibility that aminopyralid-contaminated manure has the ability to adversely affect healthy plant growth. Whilst aminopyralid appears to have a low toxicity in humans and fauna, its effects on plants- in particular food crops- have understandably caused concern amongst public and professional growers.

A reliable and accurate method is required to confirm or reject the possibility that a product is contaminated with plant-affecting pesticides. At the time of writing, there does not appear to be such a method for determining aminopyralid in manure or compost samples, nor is there an established threshold limit for aminopyralid in these products.

In the absence of both of these factors, a scientifically conducted growth trial can be used to reliably conclude whether or not a compost or manure contains levels of any substance which could adversely affect tomato plants.

## **References**

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